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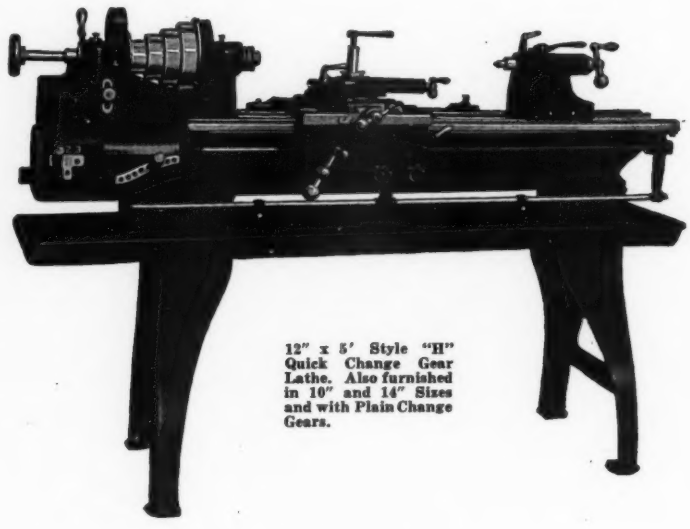

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THE INDUSTRIAL ARTS MAGAZINE

Volume XVII JANUARY, 1928 No. 1

RELATION OF MANUAL ARTS TO VOCATIONAL EDUCATION

Charles A. Wardner, Director of Vocational Education, Jackson, Michigan

MANY REASONS have been advanced for the introduction of manual training into the school curriculum, but its chief value as an educational medium is generally recognized today to be its power to bring the pupils closer in touch with real life, especially home life, and to vitalize and motivate his other school studies. It also affords a legitimate satisfaction to his creative instincts. Also the aims of this work are to enable the pupils to gain an insight into the commercial and industrial world and thus be better equipped to make an intelligent choice of a vocation. Incidentally, the child will obtain a working knowledge of the practical handling of tools and materials with a fair degree of skill and dexterity. Furthermore, the work offers the child a welcome relief from the continuous application to book studies, and promotes his physical development. Dr. Dean of Columbia University characterizes it as "the mustard in the sandwich as in most schools it is given so short a time it becomes little more than a relish." Many other claims are advanced for the work, such as the creating of habits of initiative, concentration, accuracy, and resourcefulness. It should be remembered that the purpose of this work is the acquirement of an all-around training, not of skill in a particular vocation nor the production of models or work. It is a part of the child's general education and must be closely correlated with regular academic subjects. It is lately being made more practical and useful by the introduction of a course in household mechanics.

It is true that manual training was brought into the schools for the purpose of revitalizing the curriculum, yet in many school systems we find that the teachers of the subjects have made it just as formal and dry as any of the academic subjects ever have been before. Not infrequently in the history of education the tendency of any innovation in school development has been that after a time it has become formal and the subject matter, instead of the child, has received first consideration. From the point of view of the supervisor, the child must be the paramount issue. The recent introduction of industrial subjects in the school was because of their practical social value. Even Pestalozzi had a great insight into the value of industrial training for deliquency in society. This fact has been recognized by penal institutions in this country and has resulted in many industrial schools and other manual-labor institutions. In many parts of our country today the words "industrial education" call to mind a reform school. The practical and social value of handiwork was the justification of these institutions.

Social Values Not Recognized

The schoolman has more and more sidetracked practical and social values and has appropriately named his conception of the practical arts in the school "manual training." The teachers of this work have followed the lead of teachers of academic subjects and attempt to justify their work by saying that it trains the power of observation, the reasoning factor, that it builds up general habits of neatness, accuracy, etc. Many manual-training teachers have faithfully done their work and have accidentally reached many boys through their interest in concrete things in general. This has been in spite of the prevailing theory as to the place of manual arts in the school. Teachers of manual training have been even slower than teachers of academic subjects in accepting modern educational thinking.

Many teachers have tried to justify manual arts in the school by claiming that it has vocational-guidance value, and that it is prevocational. They have failed to realize the fact that where manual training is set and formal, that is, where all boys are required to make the same projects, it often turns the boy against anything mechanical. As a result it is the social and other advantages in a trade rather than the nature of the work itself which leads a boy to choose it as a vocation. Furthermore, manual training, as it is usually taught, has had no semblance of any particular trade; therefore, it has practically no prevocational value and can claim only a formal disciplinary justification.

The tremendous recent interest in vocational education resulting in state and national aid, was necessary to get manual training out of the rut in which it had been moving complacently for years. As the vocational movement gained headway, the cry was raised, "What about manual training?" This vocational-education movement has been the best thing which could have happened to manual training. It has given it a general spring house cleaning. Manual training will stand on its own feet and will hold a definite place in general education. The constructive instinct of children is just as fundamentally educational as is their play instinct. In all children there lies dormant from infancy two general instincts—one is constructive and the other destructive. If the constructive instinct is developed, the other instinct largely disappears and if a child never learns to create things, his destructive instinct will continue to predominate.

Dr. Brewer of Harvard University, claims there is really no such thing as manual training in the old formal discipline sense and that no one would claim that engravers or dressmakers having well-trained hands would on that account be better marksmen or billiard players. He goes on to say that training and observation, correlation between hand and eye, stability of character, honesty in workmanship, and all maxims of this nature, must be discarded in the statement of the aims of manual arts. We must outgrow many of the absurd claims which used to be made for manual training. It was thought that training in one process would directly cause a gain in all other processes in which hand, eye, or mind were used and that this gain would come automatically without any conscious striving. We know now that it is our duty to go as directly

as we can to the real situation for which we wish education. All other kinds of training have about them a tang of artificiality. They are carried on in a rarefied atmosphere. "Learning in a vacuum is almost as difficult as breathing in a vacuum."

No doubt, any successful action which is thought to be interesting or useful, will serve to awaken boys and girls and will perhaps develop that most necessary possession, the sense of success or the ideal of accomplishment. If we who are interested in manual arts use false arguments, others can use them as well or better. For example: A professor of Latin recently stated in all seriousness that the study of Latin is good preparation for teaching a person to drive an automobile. He went on to state that one who is translating a Latin sentence is required to watch the ends of a number of words at once and this ability to watch a number of changing, or changeable things at the same time is exactly the thing needed in driving an automobile.

No doubt, the ideal which should fill our manual-arts workrooms in the junior high schools and part-time schools is the ideal of socially valuable work. These questions should be constantly before teachers and pupils. What practical arts does society need? What work needs to be done now? What services are required in the home, on the farm, in the school, or shop, or factory? The organization of our course in manual arts must take into consideration the answers derived from a study of these questions.

Formalized Courses Founded on Unproved Assumptions

The formalized courses in the manual arts are based on unproved assumptions, such as the assumption that a given exercise is useful for its own sake, or that an article if created will somehow or somewhere prove useful. If a home is actually in need of a taboret or a sleeve board, by all means let this particular article be made, but we should certainly suspect something wrong in the interpretation of human demand if we found all the boys in a given class making the same article at the same time. It is not likely that all the mothers of all the boys need taborets or sleeve boards simultaneously. Shall we make a picture frame because we want to teach the bevel joint or shall we teach the bevel joint because we want to make a picture frame? Shall we put a pane of glass into a window frame because we want to teach glazing, or shall we teach glazing because we want to put glass in? It would be better still, no doubt, if we taught the bevel joint because we needed the picture frame and if we taught it chiefly in and through the making of the needed frame.

What then about exercises? May we not lay down tentatively the following statement as a proposed axiom for the manual arts? Use exercises only when there is a real need for them or where there is no other way. In cutting glass it would be too expensive never to teach the exercise except on an actual job; therefore, we must practice upon scraps of glass. In teaching the cutting of iron with an acetylene torch, it would be too dangerous to place the pupil at once on production work. We must, therefore, start him out in the handling of the torch on scrap iron. There might be risks of injury to the milling machine unless preliminary exercises were given to the beginner. In vulcanizing, damage to the tire might result unless exercises upon scraps of rubber are first given. In all of such situations, no doubt, exercises are appropriate. In the teaching of certain other processes, situations will arise where a temporary resort to exercises, while offering no saving of danger or expense, will be of more advantage than actual productive work; but the tendency to get away from exercises in manual arts, unless it can be shown that such exercises have a superior value or a real necessity, is certainly a step in the right direction.

The following are some of the results of manual-arts methods:

1. Work produced, is a socially or commercially valuable article, or renders a service for which there is a real previously expressed need.
2. Work results in a socially or commercially valuable service or article for which there is a real need, which, however, is not expressed.
3. Work results in a socially or commercially valuable service or article for which there is no present need.
4. Work results in a valuable article but is produced by a roundabout or a deliberate, old-fashioned process.
5. Work results in a valuable service or article but with an inordinate expenditure of effort or time.
6. Work results in a curiosity.

No doubt the foregoing list contains many overlapping items, but in the main it can be discovered beyond a question of doubt that it represents a description proceeding from the desirable to the undesirable. Let the manual-arts teacher, therefore, check his work by the above scale and reject No. 1 for No. 2, 3, or 5, only when rejection becomes necessary.

Some teachers of manual arts have excused their work by saying that they were making men and women and were not making any definite mechanical product. The answer to such teachers is that we ought to make men and women and the product at the same time; or, as Dr. Brewer states, "We should make products for men and women, by men and women." The deliberate choice of a roundabout method, no doubt, has a bad effect upon the pupils but not so bad as seeing a thing done inefficiently. Inefficiency has a bad social effect, because it is the wasting of human effort.

One reason why we are concerned in improving methods of teaching manual arts is that we are extremely anxious that teachers of the other subjects shall learn something to their advantage by a study of the methods which we adopt in the shop. We are hoping that the time will come when teachers of English will measure their work on the basis of a scale similar to the one previously mentioned. Such specifications may at once be translated into terms of English composition both oral and written and possibly into arithmetic and geography as well.

If manual-arts teachers are to make their work serve human needs, they must avoid overattention to the bypaths such as toys, fancy furniture, or other inherently useful but decidedly restricted fields of industry. Manual arts, however, if they are practical, must relate to the daily work of mankind and if they are arts, they must be productive. The kind of work taught to children must relate to the kind of work which is being done by the workers about them. Live samples of the work of the world must be provided and the samples must be broadly selected. The most efficient teaching may be done by the project method. The project must be a thing which is thought to be a project by the pupil himself. The making of a needed article for the home is the best possible project, while the making of a bookshelf needed in the schoolroom is no less interesting and valuable.

Training Leaders Through Household Mechanics

Some of the most effective and valuable instruction has been given by tying the home more closely to the school through the medium of household mechanics. This offers one of the best possible avenues of approach to the world of social needs outside the schoolroom. Household mechanics is rich in valuable possibilities. The field, however, has not, as yet, been thoroughly explored. What better work can the school do than the training of leaders. The foremanship idea as it is being developed in connection with household mechanics offers a plan of participation in government. The method of group instruction in the general shop makes it necessary to develop and train a foreman for each group; thus, one group may be doing sheet-metal work, a second group may be working at the electrical bench, a third doing plumbing work and a fourth doing woodwork or forging. Such diversified work challenges industrial intelligence and leads to respect for workmen. Whenever a project involves work which is beyond the ability of the students, the situation offers an opportunity for the teacher to gather the students about him to hear of skills beyond present ability. The sense of social contribution and

individual achievement for social good is a more important product of shopwork than actual experience. Prevocational work, or work which offers self-discovery and tryout, forms the best possible manual-training course. We must no longer limit the projects to one or two materials, but rather to a variety of materials. It is needless to say that appropriate tools must be provided. This does not necessarily mean greater expense since other materials are usually cheaper than wood. The general shop equipment need be no more expensive than the old style woodshop.

My plea for the manual arts is for the teachers of this subject to broaden and enrich the subject by a closer study of life and its economic problems.

I do not think it is stretching the point to urge manual-arts instructors as well as all other teachers to take a greater interest in educational guidance. These problems can be skillfully worked into a comprehensive plan to the great benefit of all.

Every year vast armies of young people leave our schools as soon as they reach the compulsory age limit. In most cases they are at best only poorly trained to meet life's battles. R. L. Cooley, director of the Milwaukee Vocational School, refers to them as "The great American desert which is rich in native fertility, but which will yield only when it is properly irrigated by education." He continues, "Up to date we have scarcely favored it with an educational dewfall. Private parties have discovered a few water holes and fenced them in and missionaries with a faith worthy of our emulation 'that whosoever shall give one of these to drink shall in no wise lose his reward' are as ever found pioneering where needed work is to be done."

ADMINISTERING APPRENTICE EDUCATION IN THE VOCATIONAL SCHOOL

R. W. Tarbell, Milwaukee, Wis.

IT HAS BECOME quite well established in those states where apprenticeship has been tried that the educational program must be divided into two general parts. There is the shop end of it, consisting of practical experience in the industrial processes, and there is the theoretical side, which is frequently given in some form of vocational school. The school part of the program for apprentices is comparatively a new thing. It is only in recent years that shop people have begun to see the need of definite instruction in trade theory, while trade skills have been taught for several centuries. As a result of the need for instruction in trade theory, various kinds of vocational schools have grown up in the last few decades. They have developed a technic of their own, suited to the particular kind of jobs they face in administering instruction for their classes. This paper will discuss some of the problems that arise in connection with apprentice education in a vocational school.

Induction of Apprentices Into the School. The methods pursued in getting boys from the industries into classes in school depend upon certain conditions pertaining to the whole training program. In some places the schoolwork is offered as a voluntary proposition which the apprentice may or may not take up as he chooses. It may be an evening school, free or with tuition. The employer may pay the tuition or may not assist in any way, beyond lending moral support and saying that it is a good thing for the apprentice. Where it is a voluntary proposition there usually enters the element of solicitation to arouse the interest of the boys to the point where they will enroll.

The industry may maintain a school of its own. This is usually a room or department set aside from the regular shop, where an instructor conducts classes on a schedule that coordinates with the shop program.

There is also a plan of compulsory education, administered where there is state supervision, as in Wisconsin. These schools have legal backing. Arrangements are made with the employer to send his boys to the school. The procedure takes place in a regulated, orderly way. This is the method that public-school teachers are especially interested in. There are several simple steps to follow in a school where this arrangement prevails. There is no element of solicitation necessary. The state deputy who supervised the indenture of the new apprentice, informs the vocational school that a new boy has started to learn a trade. If the boy is already attending school, either in the grades, the high school, or in some department of the vocational school, he is automatically transferred to the apprentice department for his school period. If he is not in attendance at some school, a card is mailed to him notifying him that he has been assigned to school for a certain date. When he appears at school he is registered and placed in the proper class. All the necessary cards are filled out, and he is ready to begin schoolwork. The clerical work is a mere matter of routine. It is well to make the procedure of induction very simple, as it saves time and does not confuse the apprentice.

Types of Pupils in the Classes. In order to get a perspective of the types of boys who come to apprentice classes from the trades, we need only to observe several facts pertaining to them.

Apprentices are drawn from almost every nationality in the country. Some take to the trades more readily than others. There is quite a range in ages, extending from the sixteenth birthday to the twenty-fifth and, in special cases, several years above. The educational qualifications are from the fourth grade up through the high school. In some cases apprentices have been to college for a while.

It will be readily understood that there are all gradations and variations in the ability of apprentices. Even among pupils of approximately equal scholastic attainments there will soon be a divergence in school ability, because of individual differences. Pupils in other schools are quite commonly classified as accelerated, retarded, etc., and the same plan can be followed in rating apprentices in a vocational school. There will always be backward apprentices in some of the classes. While no exact data are available as to the causes or amount of variation existing, still some general observations are possible. The reason often given by boys for leaving the full-time school is lack of interest or inability to pass to the next grade. This accounts for the rather large number who dropped out of school from the fourth, fifth, and sixth grades, as revealed by surveys of groups of apprentices in different places. These apprentices had difficulty in doing the mental work required in the elementary school and continue to have difficulty in carrying on the work in the vocational school. They may be distinctly motor-minded and will learn well in the shop, but do not learn easily in school. Sometimes they are backward in both shop and school. Instruction for these boys should be suited to their individual capacities and needs. The plan of individual instruction, to be described later in this paper, is the principal answer to the situation. The backward apprentice is put to work upon a series of lessons laid out for his trade and is given assistance as he needs it. Simple time studies have been made in such classes to reveal what may be expected of the average student. When an apprentice falls

below the normal standard he should become the object of special attention and help. The instructor should take more time to give him the assistance he needs. There are some in the slow group who make little progress, because of the untimely termination of their elementary schooling. They may have native ability of a high order, but because of their lack of an educational foundation, they are handicapped in their work and are retarded to that extent.

There are also accelerated pupils in these classes. They are not necessarily accelerated according to an age-grade table, but are superior in ability because of a better education. That is, they have more of the tools of learning with which to work, and make comparatively rapid progress in school. Those boys who have had a year or so in high school, or who are only eighth-grade graduates, have a distinct advantage over a fourth- or fifth-grade boy, even though the native ability may not be on any higher order. Under the plan of individual instruction each apprentice can be given the work he needs. For some of the extremely retarded boys it may be necessary to provide supplementary lessons to strengthen them on weak points. For the very capable ones there should be advanced assignments beyond those required of the average pupil.

This discussion on the types of pupils gives a general view of the classes as found in various vocational schools where apprentices are in attendance. It is well to understand the significance of this, for it has a bearing on several problems that arise in administering the program.

Problems of Classification. We now come to a very practical and necessary phase of the work that must be attended to within the vocational school. The apprentices who come there must be classified according to the conditions that obtain in the community. There are several general factors to keep in mind in adopting a plan of classification. It is a much different proposition from that found in a high school or other full-time institution. One major item that should never be lost sight of is the fact that a number of employers are sending boys to the school. Their rights and interests must be considered, for they have important problems to solve also. The number of trades represented in the classes is a matter to be noted, for this will have some bearing on the plan of classification to be adopted. The nationalities in the classes should be considered. Where there are apprentices from several nationalities there are items to consider which would not come up in a community that is largely English and American. Then there are such factors as the education of the boys at the time of becoming indentured, their ages, and the facilities in the local school for giving the instruction. The kind of instruction to be offered will have a bearing on the scheme of classification. Finally, the fact that these classes meet on a part-time basis will determine in a measure some of the decisions concerning classification and organization.

With the above several factors in mind it is well to start out by looking over the entire field. This covers the community in question. In a fairly large industrial city there will likely be many employers sending apprentices to school. Among the boys sent in from the different plants there will be several trades represented in any one year. From these many sources and a variety of occupations the school is confronted with the problem of making assignments for classes. In order to work in cooperation with employers it is essential that selections for classes be made on a basis that will cause a minimum of inconvenience to industry and, at the same time, be compatible with good school organization. Where an employer has fifteen or twenty apprentices in the machinist trade it would appear that the school could make up a nice class and give profitable instruction by grouping them on one day. This would discommode the shop in its work. The school is providing only a part of the educational experience of the apprentice, as he attends classes but a few hours each week. He works in the shop the rest of the time. Obviously the employer should have some voice in the matter and determine in part the entire training program. This is a point that should not be passed over lightly. The school administrator or instructor who arranges the program with the employers cannot afford to go ahead with his eyes closed to their desires and viewpoints. An arbitrary policy of arranging the school program without any consideration for industry will almost inevitably lead to dissatisfaction, and the wiser plan is to cooperate with industry as far as is possible. A few apprentices assigned to school for each day from each plant, distributes the attendance from the several shops over the week and does not withdraw too many employees from any one shop on a given day.

The next problem has to do with sorting and classifying, after they have arrived at school. There will be apprentices from several different trades and employers, and the job is to place them in such groups in school that the best instruction can be given. This is an internal problem, and will need to be handled by the department at the beginning of each school year. There will be adjustments to make during the year as occasion arises. The idea throughout it all is to work in cooperation with industry as far as possible, to the end that pleasant relations may be retained and that the apprentices will receive the best possible educational service.

Instructional Problems. It is difficult to foresee all the instructional problems that will arise in classes of this kind, until after experience points them out. There are several factors that are almost certain to have a bearing on the work of instruction. These must be considered in preparing the school program. Some of these items were touched upon as problems of classification, and they carry through to the instructional level. The teachers are confronted at the start with the fact that the groups show great variations in school attainments. When an instructor makes a survey of his classes and finds apprentices ranging from the fourth grade to the twelfth, he begins to realize that the things he might teach any one of them will likely not be suited to the needs or capacities of the others in the same class. The fourth-grade boy may have difficulty in adding two decimals, or in multiplying two fractions. The eighth-grade boy may be ready to go ahead with finding areas of circles and volumes of cylinders, as applied in his shop arithmetic, while the high-school graduate is prepared to work problems in applied trigonometry. All through the classes there will be this same variation, usually as pronounced as that just described.

The instructor soon finds that he cannot make much progress trying to teach all of these boys at the same time, on the same material. The ages of apprentices in any one group may range from sixteen years to the middle twenties. Sometimes there are special cases of helper apprentices who are 30 or more years of age. Even if all these people had equal scholastic attainments, there would still be a variation in the classes, because of the great difference in ages. The very fact that mere budding youths are in the same class with men past the voting age offers peculiar problems of instruction, as all experienced teachers know. Differences in nationality have a bearing on instructional problems. Some boys of foreign parentage do not understand English well enough to comprehend general instruction, given by word of mouth. Also, the instructional material itself will need to be prepared with the idea in mind that different races have prejudices and points of view peculiar to their own people. The teaching must be conducive to the harmony and general progress of the group. If all these other factors had no bearing whatever upon problems of instruction, the mere fact of a great difference in capacity would soon call for some special procedure. The more capable boys would shortly be far in advance of the slower ones. These various things make it necessary for the teacher to provide instruction suited to all.

To give concrete evidence of these problems as they actually exist, let us observe the findings as they appear in a school for apprentices. The writer recently examined the class cards for a group of apprentices attending a large vocational school in the middle west. Some very interesting data were obtained. There were 21 boys in the class. Their ages ranged from 16 to 22 years. There were nine different trades represented. There were also nine nationalities represented by the members. Examination of other class cards showed that this was a typical group. It is very obvious that the same lesson in trade mathematics or trade science would not be suited to the needs of all the different boys. Even if it were possible to have classes where all the members were in one trade, still there would be difficulty in carrying on group instruction, because of the great variation in ages, schooling, and natural ability.

Another factor contributes to the problem. Since apprentices are being indentured at any time during the year, and because they are eligible for school attendance as soon as they start to work in the plant, it follows that boys will be beginning school at various times. A cross section of any class might thus reveal members who have been in attendance at school any length of time from one day to four years. Since group instruction would prove wholly inadequate in a group of this kind, instructors in some schools have naturally turned to the plan of individual instruction. This method seems to be the only way to make any progress with these classes. It has some very commendable features and will now be discussed.

Individual Instruction. The philosophy behind the plan of individual instruction has been propounded for several years. It recognizes the differences in pupils, as they have just been discussed. School people have been saying that the instruction should be more nearly suited to the individuals as we find them. Individual instruction is a plan which attempts to follow out this idea by making assignments which are adapted to the needs and ability of the pupil. Sufficient explanations are included in each lesson so that the pupils can make considerable progress without asking the instructor for help. This reduces the amount of verbal explanation required, and enables each member of the class to work on his own material and at his own rate of speed.

A plan of this kind is certainly a boon to teachers who are confronted with classroom situations such as have just been described. It can be worked out according to the needs of the local situation. The instructional material to be offered may lend itself very readily to complete working out of this plan. If the curricula are of such a nature that no two people are working on the same material at the same time, then a complete plan of individual teaching will be quite in order. There are situations arising where a modification of this plan would be better. The class may be broken up into groups, where a few boys will be studying fractions, a few others will be working problems in algebra or trigonometry, while other groups will be working at some trade science material.

There are some distinct advantages in this individual type of procedure. It enables the instructor to provide material for all the pupils. It permits each boy to make progress according to his own ability, and it relieves the teacher of a lot of detail that he would not have time to attend to. There are some disadvantages, it is true. There is the danger of an improperly balanced program, where there will be too much or too little of the individual assignment. There is some danger of overlooking the individual pupil who most needs help. There is also the disadvantage in the fact that the give-and-take of a class discussion is absent during much of the class period. The advantages appear to outweigh the disadvantages, however, and make the plan a very desirable one for giving instruction in classes of this kind.

It would be wrong to leave the impression that the procedure should remain unaltered throughout an entire class period. Several hours of silent study would prove monotonous to most classes. The pupils might be gathering a large amount of useful knowledge, but there are other sides to the problem of education besides storing the mind with facts. There should be some opportunity for oral expression. These boys should learn how to talk, to discuss things with each other, and to make decisions concerning the opinions of others. Such experiences will not only be a benefit to them educationally, but will relieve the tedium of individual study and make the entire school period more efficient.

The actual procedure in a plan of individual instruction can be worked out and administered in a very simple manner. The various courses of study are set up in units of one lesson each. A lesson may cover one or more pages and have full information in it as to the handling of the work. These should be stored and labeled in such a way that each apprentice can draw the lesson he needs. By this plan each boy is started on a series of instruction sheets, and is assisted in working through them as rapidly as his ability will permit. There are no conflicts in the work of different members in the same class. Several different trades may be represented in a group, but the work will progress without interruption, because each member is on a different assignment. When the lesson is completed, or when special help is needed, the apprentice consults with the instructor, who gives him the necessary personal attention. There will be no formal class lectures, recitations, or discussions, in this part of the program. It is a period of individual work, where each one is a unit, moving according to his capacity. It is thus seen that no problems of conflict in the classes, such as might otherwise arise from nationality, age, grade, trade, or ability, have any effect on the instruction. Each member can make his own progress in the group as well as he might in a class by himself.

The Class Program. We now come to a consideration of what takes place during one complete weekly period in school. This may be one-half day or a whole day, according to local arrangements. The organization of the program will depend upon the size and number of classes, trades taught, etc., as well as the facilities at hand for giving instruction. When the classes assemble they go to the assigned rooms and begin work. Some will go to the drafting room, where drawing is taught for the different trades. This is all on an individual basis, so that an apprentice boilermaker can be working on drafting for his trade, and not be disturbed by the fact that there are apprentices from several trades working in the same room. In another room there may be a class in shop mathematics, or a group doing work in trade science, all on an individual basis. Still others may be taking some laboratory science work.

These classes should usually continue for an hour or more and then change to some other work. The boys may go from drafting to mathematics and vice versa. The time given to each room will depend almost entirely on local conditions. As mentioned already, there should be some time given to a general period, where the lecture and discussion may be given proper emphasis. This part of the program may give consideration to instruction of a general nature, suited to all trades and stages of preparation, taken from the fields of the social studies, general science, and current events. When the session is over, the pupils are dismissed until the next weekly period. If there are classes coming each day, the general part of the program may be repeated throughout the week. This means that the instructor will be planning certain parts of his program by weeks. The individual lessons, when once set in motion, will move along with the different apprentices according to the accomplishments of each.

Apprentice Records. Records are a necessary part of school administration. These should be kept in an efficient, simple way, so that essential facts can be easily gathered as needed. There should be some form of registration blank. This will hold all the desired information about a new appren-

tice. A central office card may be made out from this. The instructor will need records for classroom use. There will be an attendance card to extend for a year, more or less. It may be desirable to keep a grade card for recording quantity and quality of work, unless this can be entered on the attendance card. It has been found by experience in different schools that a report sent to the employers of apprentices is appreciated by industry. This can be sent out at regular intervals. If the school is under state supervision, there may be state reports.

Just a word of caution may be in order in the matter of records. It is easy to go to extremes in filling cards with a mass of information concerning apprentices. There are some essential facts which should be gathered. This ought to be done in a simple, straightforward manner. The record keeping should be accurately and efficiently done, but records are not the main objective. Instruction is the important thing. These other matters are necessary, but should not receive undue emphasis.

Conclusion. It has been the attempt in this paper to show how some of the administrative problems arising in the apprentice classes of the vocational school may be met and solved. There are many features that are different from a full-time high, or grade school, and these require new modes of procedure, as well as a special technic. The methods that apply in one locality may need to be altered in other places. It is hardly safe to say that any administrative plan can be standardized yet. It is essential that administrators and teachers approach the various problems with an open mind, using whatever is good from every available source, and providing a program of education that will supplement the trade instruction given in industry.

SELECTION AND ARRANGEMENT OF SCHOOL PRINTING EQUIPMENT

Merritt W. Haynes

IN VISITING numerous printshops throughout the country during the last few years, the writer has frequently been astounded not only by the ill-assorted items of equipment, but also by the inefficient arrangement of the equipment. Twelve-inch composing sticks and four-quart benzine cans have been seen in an elementary school. In one place where a new and complete outfit had just been installed, the presses were placed at one end of the room and the stock cabinet at the other. This made it necessary to carry all stock through aisles between composing stands to the presses, thence through other aisles to be stitched, and through still other aisles to be trimmed. In another place, the chance location of an electrical outlet diagonally across the room from the entrance door determined an inconvenient location of presses, whereas at slight expense, an extension of the electrical conduit could have been run to a suitable location. In some places, composing stands are placed so that some pupils work with their backs to the light, and others face a glaring light. Or again, composing stands are placed in the darkest part of the room with storage cabinets in the best light. There are school shops where the imposing table is at the opposite end of the room from the presses.

Such arrangements usually can be corrected by a little careful study. It is oftentimes surprising to see what transformations can be brought about without expense, by the application of some common sense. Engineering standards have practically revolutionized commercial printing plants during the past few years, and the school printshop should be no less efficient than the commercial plant.

The problem of equipping a school printshop should be worked out according to the same basic principles obtaining in the equipment of any other school shop. These principles may be summarized as follows:

1. The equipment should be selected primarily with reference to facility of instruction.

2. It should be adequate for the number of pupils to be accommodated, neither too meager nor excessive.

3. It should be of a quality in keeping with the equipment of the rest of the school and the general character of the community.

4. It should be arranged to secure maximum efficiency of instruction.

We will now consider the particular application of these principles to the school printshop.

Selection According to Instruction Needs

The printing equipment should be representative of the rudimentary operations of printing—setting type in the stick; proofing composition; locking up the form; making ready on the press; feeding the run; complete the job by folding, stitching, punching, trimming or padding. Large volume of production is not the aim in the school printshop; therefore, the equipment should be moderate in size and as simple as possible. Since this equipment must be handled by novices, not by experts, it should be of minimum complexity. Printing equipment at best requires many separate items, but the fewer these items, the easier will be the work of the teacher in managing his classes.

Platen presses in sizes 8 by 12, 10 by 15, or 12 by 18 in. are large enough for ordinary school printing. Where a school publication of large sheet size is to be printed, a pony cylinder press will be found of advantage. All presses should be motor driven.

A foot-power stitcher and punch will serve in most schools except in trade or vocational schools, in which motor-driven machines are proper because the pupil will be required to use these machines when he enters the industry.

The equipment of type should also be kept simple. A single type family in roman, bold and italic ranging in size from 6-point to 24- or 30-point, with a few job fonts in larger size for display, will be sufficient. In addition, a few sizes of card gothic and a text face will furnish as much display as most school printshops should attempt. Good typography is characterized by simplicity, not by extravagance in display.

For school use the principal type face should be strong and rugged, with no hair lines or overhanging kerns, and with fairly open counters and fairly wide spacing. These factors make for both durability of type in handling and also for maximum legibility. For advanced pupils in the trade or vocational school a classic face like Caslon should be provided, but this is not the kind of type face most suitable for beginners.

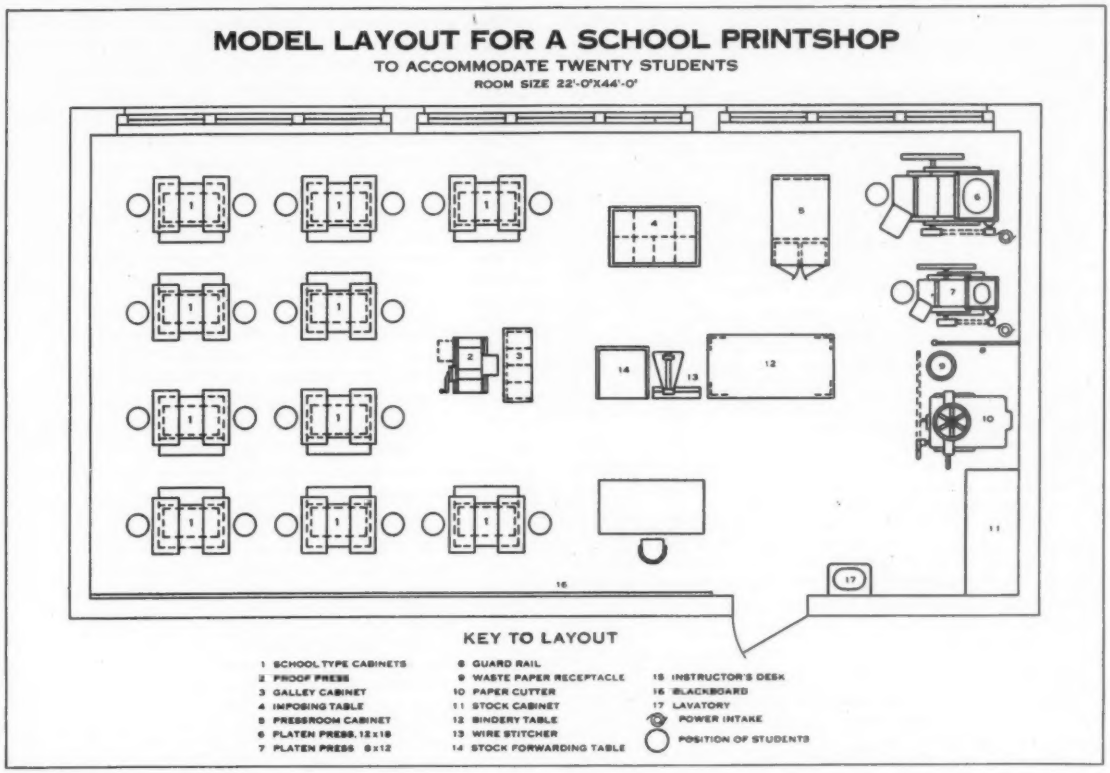
Accommodation of Pupils

There should be as many composing stands and composing sticks as there are pupils in the class. Every pupil receiving instruction during the term, also should be furnished with an individual galley for the storage of the project on which he is working. Five classes a week, twenty pupils per class, would thus require one hundred galleys. Pressed steel galleys about 8¾ by 13 in. are inexpensive, and an ample supply of them is highly desirable.

Each pupil in the class should be provided with a 20-lb. font of 10-point body type. (Where budget is restricted, 10-lb. fonts may be used.) For the usual class of twenty pupils, provide two 20-lb. fonts of 8-point, also of 12-point. One or two job fonts in each of the other sizes desired will suffice for the junior high school.

News cases are going out of use in commercial printing plants and should not be used in schools. California job cases are much more satisfactory. All type cases should be full size.

Two or three presses will provide a reasonable participation in presswork for all pupils in a class of twenty. These presses should be of different sizes to handle all the kinds of work to be printed.



Suitable Quality

The school printshop should be just as attractive and dignified in appearance as the gymnasium, cafeteria, library, laboratories, or classrooms. Old-fashioned, unvarnished case racks and tables are, therefore, as much out of place in a school printshop as they are in modern printing plants. Composing stands, imposing tables, drying racks and similar pieces should be of the cabinet style, nicely varnished, attractive in appearance, and compact and efficient in use.

It is of the utmost importance that proper safety precautions be observed in the installation of printing machinery. Platen guards, gear guards, flywheel guards, and brakes should be provided for all presses. Paper cutters should have safety latches. All belts and other moving parts should be securely inclosed. No avoidable chances should be given for pupils to incur injury from the use of the printing machinery.

On some machines, safeguards are regular equipment; on others the safety attachments are extra and should always be specified.

Efficient Arrangement

The first consideration in arranging the equipment in the school printshop is convenient handling of the class. The instructor's desk is the key to this arrangement. It should be located in the most commanding position in the room, preferably near the entrance, within full view of and ready access to every pupil working in the room. The blackboard should be handy to the instructor's desk and in full view of every pupil.

Type cabinets or composing stands should be placed so that the window light comes from the sides of pupils working at the cases.

The proof press should be readily accessible from the composing stands to facilitate proofing and correcting. The imposing table should be in a central location between composing stands and presses, and should be accessible on all four sides, although where floor space is restricted the proof press or galley cabinet may be placed against the end of the imposing table.

The proper position of the platen presses is sidewise to the window so that the light comes from the feeder's left side. The drying rack and ink cabinet should be readily accessible from the press, and placed preferably behind the feeder. Cylinder presses should be placed with delivery end toward the light, and should have ample working space all around.

Proper storage and efficient handling of stock should be carefully considered. The stockroom or stock cabinet should be located near the entrance to the room, and the paper cutter belongs between the stockroom and the presses so that there may be minimum transportation of stock from stockroom to cutter, to presses, to bindery tables, stitcher or punch, then back to the cutter for final trimming, and finally back to stockroom or delivery out of the shop.

Any printshop has really two sections, the composing room being one and the pressroom and bindery the other. There should be no crossing of the route of the composed type to the presses and back to type cases for distribution on the one hand, and the route of the stock on the other hand.

Frequent washing of hands is necessary to produce neat printing, and should be provided for by convenient washbowls in the room.

Before installing a school printing outfit, a careful layout should be made of the shop to determine the exact position of each piece of equipment. In fact, this layout should be made before selecting the items of the outfit for purchase, because the conditions of floor space will often determine just what style of furniture is most convenient. This is particularly true of type cabinets. Independent cabinets accessible on all four sides are preferred, but sometimes wall cabinets are necessary to suit the floor area and to give sufficient working space.

The best way to plan a school printshop is to work in cooperation with the architect before the construction of the building is begun. In this way the most satisfactory location of entrance doors, stockroom, lavatory, power outlets, ceiling and drop lights, and similar features, can be secured without extra expense.

Schools of printing will do well to have the layout prepared by the staff of engineers of a reputable printing-supply house. This service, which is usually furnished gratis to prospective customers, will prevent expensive mistakes in planning and will oftentimes suggest valuable ideas for securing the most advantageous items and arrangement of equipment.

Below is given a list of equipment to accommodate a class of twenty pupils. This list has been carefully selected in conformity with the principles previously discussed. A model layout of this outfit is also given, showing a room 22 ft. wide which is common in modern schoolhouse construction.

Machinery

1 Platen press, 8 by 12 in., with single disc, combined gear-and-pinion guard, crankshaft; 3 semisteel chases; 6 roller trucks; 6 roller stocks; 2 wrenches and brayer.

Extras for 8 by 12-in. Press

1 Fiber flywheel guard.
1 Platen guard.
1 Press brake, casting, three rollers and brayer.
1 Motor bracket with belt-tightening adjustment including pulley.
1 Motor, ¼ h.p., variable speed, with pedestal control, belt drive.
1 Platen press, 12 by 18 in., with single disc, combined gear-and-pinion guard; crankshaft; 3 semisteel chases; 6 roller trucks; 6 roller stocks; 2 wrenches and brayer.

Extras for 12 by 18-in. Press

1 Fiber flywheel guard.
1 Platen guard.
1 Press brake, casting, three rollers and brayer.
1 Motor bracket with belt-tightening adjustment, including pulley.
1 Motor, ½ h.p., variable speed, with pedestal control, belt drive.
1 Lever cutter 30 or 30½ in.
1 Proof press with printing surface approximately 14 by 18 in., mounted on a cabinet stand, with shelves for proof paper and hinged door compartment for ink, gasoline, rags, etc.
1 Wire stitcher, foot-power.

Furniture

10 School type cabinets, varnished, each to accommodate two pupils; detachable galley dump for two galleys and compartment for leads and slugs 4 to 9½ picas by half picas; lead and slug rack for lengths 10 to 26 picas by picas; one full-size blank case with cabinet front and runs for 16 more full-size blank cases with cabinet fronts.
1 School imposing table, wood, varnished, with iron surface 35 by 51 in.; one side containing a capacious drawer, reglet font, wood furniture font and adjustable chase rack for 12 chases; the other side containing 51 numbered galley shelves and an adjustable chase rack for 6 chases.
1 Unit galley cabinet, wood, varnished, four tiers, with numbered steel runs (no shelves) for 100 galleys 8¾ by 13 in.
1 School pressroom cabinet, wood, varnished, containing twelve dryers, compartment for 16 rollers of any length up to 31 in., two metal-lined spring-hinged compartments for rags; three compartments for ink; two shallow drawers, one for tools, and one with plate-glass ink-mixing slab.
1 Bindery table, size 36 by 72 in., steel top and frame.
1 Stock forwarding table, 30 by 30 in., over all, with iron caster wheels.
53 California job cases with cabinet front.
3 Quadruple cases with cabinet front.
1 Metal furniture case with cabinet front.
1 Quarter-size rule case.
1 Leader box.

Type, and Spacing Materials

2 fonts 6-point Century Schoolbook.
40 lb. 8-point Century Schoolbook.
400 lb. 10-point Century Schoolbook.
40 lb. 12-point Century Schoolbook.
20 lb. 14-point Century Schoolbook.
20 lb. 18-point Century Schoolbook.
2 fonts 24-point Century Schoolbook.
1 font 30-point Century Schoolbook.
1 font 36-point Century Schoolbook.
1 font 6-point Century Schoolbook Italic.
2 fonts 8-point Century Schoolbook Italic.
2 fonts 10-point Century Schoolbook Italic.
2 fonts 12-point Century Schoolbook Italic.
2 fonts 14-point Century Schoolbook Italic.
2 fonts 18-point Century Schoolbook Italic.
1 font 24-point Century Schoolbook Italic.
1 font 6-point Century Schoolbook Bold.
1 font 8-point Century Schoolbook Bold.
1 font 10-point Century Schoolbook Bold.
1 font 12-point Century Schoolbook Bold.
1 font 14-point Century Schoolbook Bold.
1 font 18-point Century Schoolbook Bold.
1 font 24-point Century Schoolbook Bold.
1 font 30-point Century Schoolbook Bold.
1 font 36-point Century Schoolbook Bold.
1 font 48-point Century Schoolbook Bold.
1 font 6-point No. 21 Heavy Copperplate Gothic.
1 font 6-point No. 22 Heavy Copperplate Gothic.
1 font 6-point No. 23 Heavy Copperplate Gothic.
1 font 6-point No. 24 Heavy Copperplate Gothic.
1 font 12-point No. 25 Heavy Copperplate Gothic.
1 font 12-point No. 26 Heavy Copperplate Gothic.
1 font 12-point No. 27 Heavy Copperplate Gothic.
1 font 12-point No. 28 Heavy Copperplate Gothic.
1 font 18-point No. 29 Heavy Copperplate Gothic.
1 font 18-point No. 30 Heavy Copperplate Gothic.
1 font 8-point Engravers Old English.
1 font 10-point Engravers Old English.
1 font 12-point Engravers Old English.
1 font 14-point Engravers Old English.
1 font 18-point Engravers Old English.
1 font 24-point Engravers Old English.
5 lb. 6-point Spaces and Quads.
15 lb. 8-point Spaces and Quads.
120 lb. 10-point Spaces and Quads.
20 lb. 12-point Spaces and Quads.
10 lb. 14-point Spaces and Quads.
10 lb. 18-point Spaces and Quads.
5 lb. 24-point Spaces and Quads.
5 lb. 30-point Spaces and Quads.
5 lb. 36-point Spaces and Quads.
1 font 48-point Spaces and Quads.
10 Half fonts 2-point leads, 4 to 9½ picas, by half picas.
10 Half fonts 2-point leads, 10 to 26 picas, by picas.
10 Half fonts 6-point slugs, 4 to 9½ picas, by half picas.
10 Half fonts 6-point slugs, 10 to 26 picas, by picas.
3 lb. 2-point L.S. rule No. 1002.
1 Font 2-point miters for rule No. 1002.
25 lb. metal furniture, labor-saving font.
3 lb. leaders, 10-point, series 546, four dots to the em.
1 lb. 10-point braces and dashes.
1 lb. 10-point fractions.
½ lb. 10-point references.

Borders, ornaments, and additional fonts of type with necessary type cases to be selected and ordered as needed from time to time.

Miscellaneous

20 Job composing sticks, 6 by 2 in., nickel plated.
1 Pica stick, 8 by 2 in., nickel plated.
1 Pica stick, 12 by 2 in., nickel plated.
100 Pressed steel galleys, 8¾ by 13 in.
1 All brass job galley, 8¾ by 13 in.
1 All brass job galley, 6 by 10 in.
1 Benzine can, quart; 1 benzine brush.
1 Hickory mallet; 1 type planer.
1 Proof planer.
2 Doz. Hempel quoins No. 1.
2 Quoin keys No. 1.
1 Doz. spring-tongue gauge pins.
1 Ink knife, 6-in., square end.
1 Card cutter, 12- or 15-in. blade.
1 Counting machine, Redington, model D.
1 Numbering machine, Boston model No. 1, five wheels.
3 Pairs roller supporters for 8 by 12-in. chase.
3 Pairs roller supporters for 12 by 18-in. chase.
1 Line gauge, eagle, nickel-plated, pica and nonpareil, 12 in.
1 Oily-waste can.
1 Assortment of inks, ¼-lb. tube of each of several colors.
1 Set "Visual aids for instructiong in printing," 24 charts, 11 by 14 in.

HOW TO CONSTRUCT AND USE A SHOP RATING SCALE

Ammon Swope, Associate Professor of Trade and Industrial Education, Purdue University

EXACT MEASUREMENT is impossible. The instruments of measurements may be highly refined or they may be very crude. The necessary refinement in any given case, it is evident, depends on the nature of the case. The carpenter works to the sixteenth of an inch but the machinist must not stop short of thousandths and tenths of thousandths and in some highly specialized cases he works to millionths of an inch. In such accurate measurement, it is obvious his measuring instrument needs to be of a different type than for cruder measurements.

In any type of measurement, no matter how refined, we must deal with the important factor of error. Let us take a familiar example. A shaft is to be turned to a diameter of 1 in. Now there is no known machine that will turn to the exact dimension, nor is there an instrument of precision that will measure a diameter of exactly 1 in. Much time and effort have been spent in reducing the error in various measuring devices, but the sources of error must still be reckoned with in all cases of measurement.

It is the purpose of all measuring instruments to express the relationship of the thing measured to the unit of measurement in some objective way. It is comparatively simple to determine, through analysis, the objective factors in materials that may be measured, but when we come to situations involving the more subtle factors, such as personality, it is not only more difficult to render them objective but also increasingly difficult to detect the sources of error in measurement.

In the material world, then, we have set up such devices as the yardstick, the calorie, and the gram. If we are dealing with a boy in the shop, and if the limits of error to which he is working are $\pm$ .005 in. for a particular job, we can with the proper instrument detect directly the boy's ability to meet that condition through measurement of his product. The standard of workmanship required here is not determined by the boy but by the use to which the product is to be put. Any measuring instrument that stands between the boy and the ultimate product is for the purpose of bringing the job within certain limits of error. It is evident that if the finished product is to meet the specifications of 1 in. $\pm$ .005, that objectively we are concerned with that result if the product is the end in view. On the other hand, if the boy is in training, to produce this result in the most efficient way we are in need of another type of measuring device. That is to say, we need an instrument that will measure the potential producer. It is at this point that our thinking is often muddled in the construction of a satisfactory measuring instrument for the boy.

There are devices for the measuring of the ultimate material products which are accurate enough within the permissible limits of error and are wholly objective. These are one hundred per cent efficient when applied in the correct situation. But we do not have any instrument that is free from the subjective element when we attempt to measure the possibilities of the boy. Much less are the allowable limits of error known.

Because of these facts the rating scale has been brought into use in our school-shop procedure. It seems perfectly obvious that all of those factors in the training of a student that may be measured by a purely objective instrument of measurement should be measured in that way. The next necessary step, then, would be to segregate other factors which should be measured and reduce the subjectivity wherever possible.

It is the purpose in the following paragraphs to point out some of the methods that have been conceded to be most valid in the construction of such a measuring instrument and to indicate how a shop teacher might organize such a device for his own use.

How a Rating Scale May be Constructed

There are three methods of educational classification of students. They are (1) personal opinion, (2) comparison, and (3) standardized tests. The rating scale is one form of comparison. In order to understand the construction of the rating scale let us consider first the conditions under which it is used at its best.

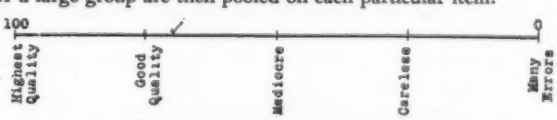
The rating scale may be used where measurement within known limits of error is impossible. This does not mean that it may be substituted in lieu of a better-known instrument. It is to be looked upon merely as a temporary makeshift which is usually better than the personal opinion or snap judgment of an individual. Why it is better will be pointed out in a later paragraph.

The rating scale may be treated statistically. It is unnecessary here to go into an extended discussion of the value of statistical procedure in all sorts of measurement. Since there are known sources of error in all types of measurement, the error problem becomes an important one. By certain mathematical procedure we discover in the study of any group of homogeneous facts the probable error, and thereby have indicated the amount of unreliability in the tendency of the group. Properly constructed rating scales lend themselves to this statistical treatment.

The scale may be and should be in most cases devised and used in a homogeneous group. This idea of homogeneity should persist in both the construction of the test and in the use of it. The shop rating scale as now used by many teachers is applied by one teacher to many boys. A better plan would be for many teachers to apply the scale to one boy. Thus one would have the homogeneous effect on one individual with perhaps a fair degree of reliability. The first method results in a diffusion that is biased by individual prejudices and inconsistencies.

It is at once evident that if a rating scale is to be devised, we must, first of all, segregate those factors that are to be included in the scale. This usually means an analysis of the subject which is being taught and also a determination of the qualities that an individual must have in order to turn out a specified product. The procedure, then, is to determine those conditions and qualities that may be objectively measured and provide for their measurement. The most subtle factors may then be set down in some form of rating scale.

But how? Here the construction is similar to the use, because in constructing the scale, these factors also are best determined in a homogeneous way. In short, they should be determined by those who have had experience. The judgments of a large group are then pooled on each particular item.



The Form of the Rating Scale

The form that the scale is to assume makes some difference in its construction. If a graphical checking scheme is devised there must be terse but clear explanations of what is to be done. Investigations seem to indicate that the number of qualities should be relatively few with carefully worded short definitions. In order to make the checking as objective

as possible, a plan now in vogue that appears to be very effective is to place a check on a horizontal line under which are written the various degrees of the quality indicated in the line. A measuring device may be laid along the line and an exact rating given which the rater is unconscious of at the time of checking.

Another method that is sometimes used is the "order of merit" arrangement in which the individual is given a position in a group of qualities by a number of judges. As in the former case homogeneity is important.

The apparent simplicity of a rating scale often clouds the real sources of error in its use. The rater may be working under pressure and has little time to refine his judgments in giving a rating. The terms used in a scale are necessarily abstract. It is much more difficult to think in terms of the abstract than the concrete. In checking a scale on an individual, a concrete situation is likely to influence the rater so that it is difficult to think abstractly. The "halo" effect in which the rater is previously prejudiced in favor of, or against, an individual makes it almost impossible for him to give a consistent rating. Homogeneous ratings often show very absurd tendencies on the part of some individuals in this respect.

Many raters are very indefinite in their ideas and are not consistent in their ratings from time to time. Even in homogeneous rating it is difficult for the experienced raters to think in the same terms even after the qualities have been studiously agreed on and defined.

It is as necessary to test for errors of this type by some statistical means as it is to determine validity by a well-recognized analytical procedure. The best we can say is that the rating scale, because of its subjectivity and subtle qualities is, and may remain for some time, very unreliable as an instrument of precision.

THE NEED AND VALUE OF RECORDS

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THE age of scientific management with 100-per-cent efficiency as a slogan should prompt instructors of vocational subjects to consider carefully the entire field of marks and ratings.

We must have definite assignments and then carefully appraise quality, quantity, cost of materials, and elapsed time before attempting to rate any student. The question of age, both mental and chronological, previous training and possibly aptitude, and certainly attitude, should be considered in giving marks, grades, efficiency records, or scores of any nature that may be used in evaluating work or ranking students.

The value of any marks or grades used in promotions, the giving of privileges or honors, or in recommending students for positions, should be carefully considered and one should be prepared to show the basis of the marks assigned. Too often grades depend upon the whims of individuals and may vary with the emotions of the person giving the marks. Such marks may have their place in a system of opinions but hardly should be used to brand one as a failure in certain prescribed work.

Records to be of any value must be:

1. Immediate to be of any value. Records can be immediate only when a carefully planned program is followed and an interminable mass of useless figures is not allowed to obscure the real facts desired.

2. Reliable and based upon data of unquestioned accuracy. Time records and production records can be made dependable. Opinions are valuable at times, but should be expressed as such, not as reliable data. Answers to such questions as, "Tell all you can about this or that," are valueless in the collection of reliable records, for one unable to tell anything is entitled to 100 per cent for he has told all he can.

3. Permanent, because permanent records only are of direct benefit to both the one assigning the record and to the one tested. School records should be carried forward and ultimately become a part of a permanent shop record. Every such record should show clearly, time, place, by whom assigned, and basis of assignment.

4. Adequate to cover whatever subject, topic, project, or job is to be recorded. This may include many divisions, including the time element.

5. Records should be kept to show the habits that an individual has acquired; such as promptness, accuracy, and reliability, all of which are important in any walk of life.

With a scientific scaling system, with accepted standards of work for definite time intervals for those of different degrees of proficiency, and accurate cost systems for materials, the instructor should have a well-defined system of grading, or scoring, that will make it possible for anyone readily to evaluate the work done by a student in any school and thereby give proper credit for work done under certain standard conditions.

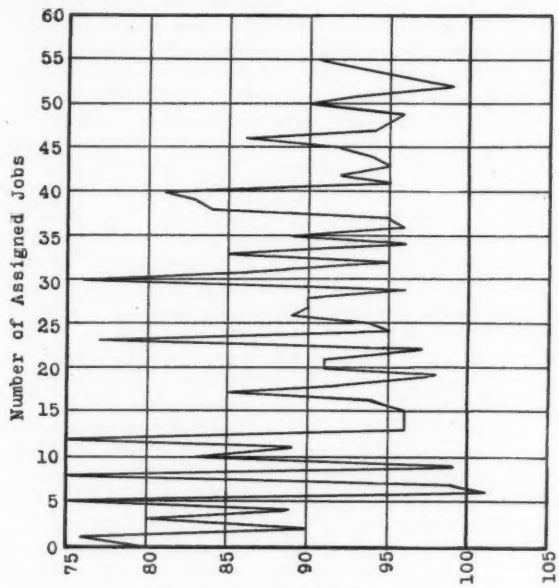


Fig. 1

This chart shows the record of a student consistently below standard in output. Quality must be standard. He should receive special attention to attempt to bring him to normal output in his present job. If it seems impossible for him to do the required work, he should be changed about until he finds himself and can produce a normal amount. Otherwise, industry is to blame for a poor workman, equally the school for a poor student.

To illustrate: In the printing industry there should be a certain standard for an efficient linotype operator, or a job compositor, that will be a definite measure by which individuals may be compared and ranked when making recommendations for positions, or for making a change. Such standard records would be valuable in giving credit: (*a*) from school to school, (*b*) from school to industry, (*c*) from industry to

school, and would enable students to enter industry with proper credit for work done in trade or technical schools, and enable them to advance rapidly with due credit for work satisfactorily done. Cooperative plans, now in successful operation, exchange records and give proper credits.

We use the term 100 per cent in talking about standings in school, records in factories, or the efficiency of machines, or of men. What does the term mean? What is 100 per cent?

The writer is accustomed to take a certain train, and in order to catch the train must travel a mile from the office to the depot. His schedule is 20 minutes. Eighteen minutes requires extra exertion on his part and any delay would cause him to miss the train. Twenty minutes is his schedule, and when his actual time is 20 minutes he is comfortably seated when the train starts, and he is 100 per cent efficient on that particular job. A delay would cause him to miss the train and require a wait of 35 minutes, thus lowering efficiency. Were he able to cut 14 minutes off his schedule he could get an earlier train, and his efficiency would be high.

If one divides 24 cents by 6 cents the result is 4. The question at once arises, "Four what?" And one must answer, "Four groups of 6 cents each." The ratio, or the relation of the two quantities is expressed.

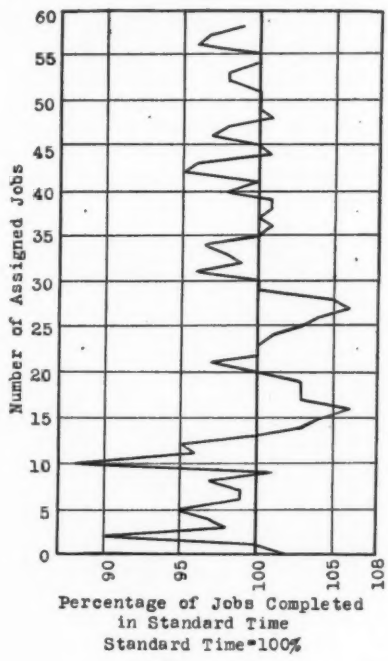


Fig. 2

This chart shows the record of a consistent good worker, if his attitude remains as is, he should develop into a good workman, as he now is a productive student.

This is fundamental and vital to the discussion that follows and must be clearly comprehended, for in mathematics nothing is taken for granted and everything must be absolutely and logically proved, or its value is worthless.

Twenty-four cents divided by 4 equals 6 cents, the number of cents that will be in each group when 24 cents is separated into four groups.

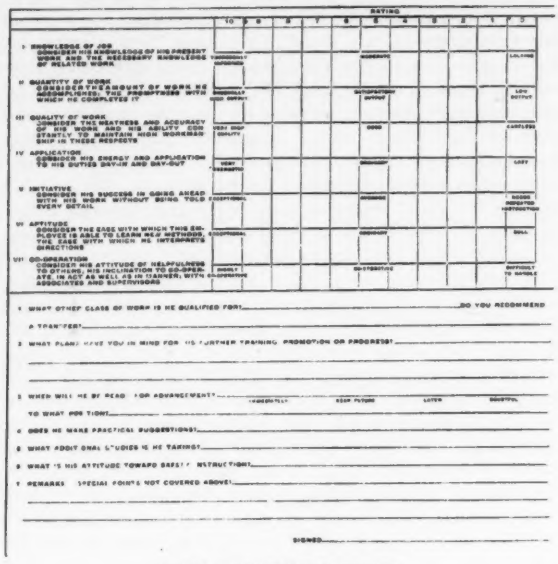
Per cent simply means another form of ratio, or comparing of two like numbers, and expressing the results in hundredths. A given number or quantity is compared with another like number or quantity and the result is expressed in the form of hundredths. In each case there is a comparison and in each case there are certain relations that can and do exist.

If after careful study and experiment under normal conditions and controlled surroundings and materials, it is found that 4 hours is a reasonable time in which a man can perform a given piece of work, that time may be set as a standard time. Unconsciously we all set standard time for most of our movements in this world. The New York Central has found that "The Twentieth Century" can make the run between Chicago and New York in 20 hours. That is the standard time and everyone attempts to operate that particular train in that definite time. Its schedule calls for 20 hours, and each part of the run or operation is planned and arranged to meet the conditions imposed by the schedule. We schedule our day's work by arising at a certain time, performing certain tasks within time limits, catching a certain car, elevated train, or railway train, arriving at our work at a certain time and then sometimes we ask, "Why am I given a standard time or schedule to follow in performing my tasks?" Modern business demands definite time schedules in delivery and only by careful planning and scheduling down to minute details can the deliveries be made according to sales schedules. This demands that each individual do his share and this has led to time studies, standard time, efficiency records, and various systems of bonus payments in different organizations. These are to influence individuals to put forth their best efforts and to assist in maintaining an organization that can be relied upon to perform the allotted tasks and to make deliveries possible within the promised time, in satisfactory condition and within the estimated cost of production, for only by so doing can an organization continue to exist and flourish and give employment to anyone. We will now return to our workman, who had an estimated time of 4 hours in which to perform his task. Conditions being normal, he performs the job within the limits set and his actual time is 4 hours as against the estimated time of 4 hours, and we find by division that 4 hours (estimated time) divided by 4 hours (the actual time) equals 1, equals the relation of the two numbers of hours. The whole of anything is always 100 per cent of it, hence we say the man's rate of doing work, as compared with a reasonably estimated time is 100 per cent, or we say the man is 100 per cent efficient. Again, we may say a man is 100 per cent efficient and knowing that the estimated time is 4 hours, we know at once he took 4 hours to perform the work, as 100 per cent of 4 hours is the whole of it, or 4 hours. Under all conditions we can determine a man's efficiency as compared with a certain estimated time, if we know the actual time and the estimated time. If the actual time is 5 hours and the estimated time is 4 hours, the comparison is as follows: 4 hours (estimate) divided by 5 hours (actual) equals $\frac{4}{5}$, equals the relation between the two times (meaning the man is $\frac{4}{5}$ as competent, or efficient, as someone else, or as is his own standard record). As $\frac{4}{5}$ equals 80 per cent, we say the man is 80 per cent efficient.

If we find that some one performs the task set for 4 hours in 3 hours we have: 4 hours (estimate) divided by 3 hours (actual) equals $\frac{4}{3}$, equals the relation between the two times (meaning the man is $\frac{4}{3}$ as competent, or efficient, as some one else, or as is his own standard record. As $\frac{4}{3}$ equals 133 per cent, we say the man is 133 per cent efficient, which simply means that he can and does perform more than the standard amount set for the class of work performed. Various methods of rewards, or bonus payments, are in use to make it worth while for men to strive for high efficiency records. In some places these rewards take the form of promotions, money payments, or vacations. (See Figs. 1, 2, and 3.)

In the charts reproduced, if the vertical column of figures represents the number of jobs or assigned tasks, then a curve following the column represents 100 per cent when the jobs are completed in the estimated time. The distance to the left indicates records less than 100 per cent, as shown by

the horizontal column of figures, and distance to the right records time above 100 per cent. One must bear in mind that in this discussion 100 per cent does not mean perfection, but



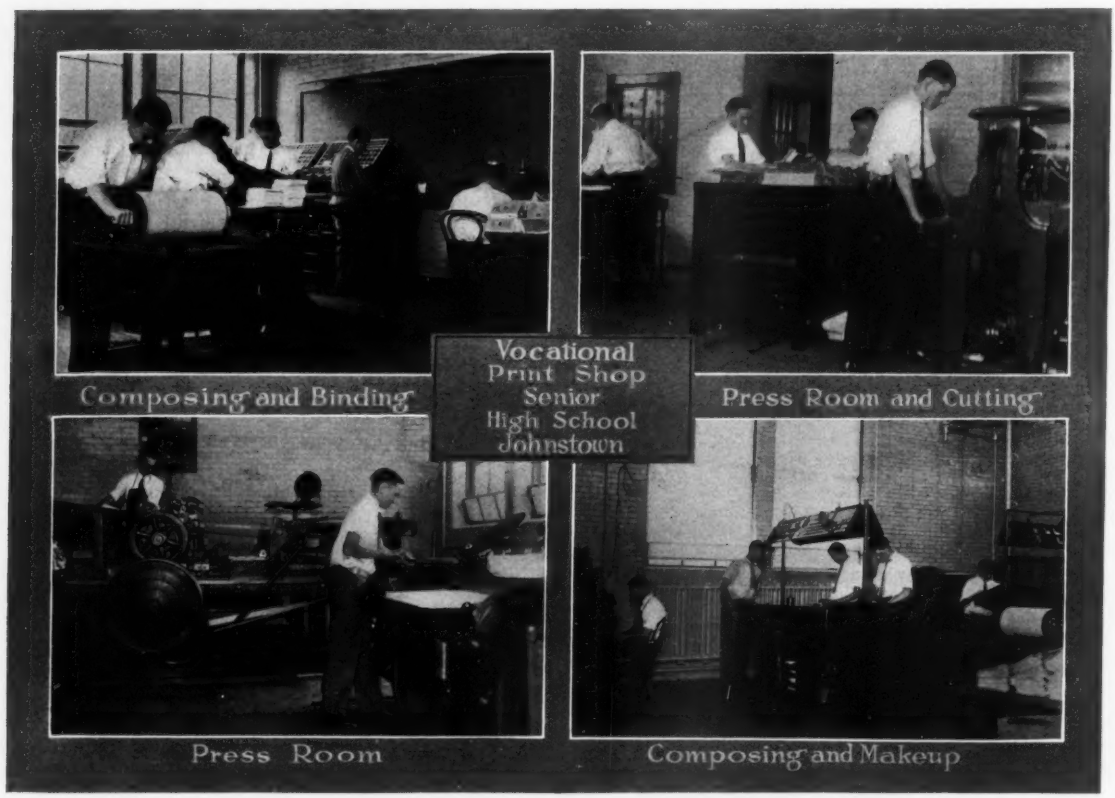
A method of rating that may be suggestive in determining what is desired in records

FIG. 3.

is used as a relative term to indicate that the work was accomplished within certain prescribed limits. The quality was standard and an estimated time, carefully arrived at by time studies, was set for each job. If the records are reliable the graph shows actual performance. The charts are purely diagnostic and may be used to show a student his relative output, or production during definite intervals. This is possible only where quality is standard (as it should be in all training) and quantity varies, or where time-basis records are used in assigning grades, marks, or in evaluating work. The accuracy of such charts and hence their value depends entirely upon the accuracy of the data used in their compilation, that is, the relation of the time element and standard production.

The world-famous trains are 99 per cent efficient year in and year out, and people gladly pay excess fares for the service. In any line of business where we can secure service that is of the best we gladly pay the price. How do we measure? By results, and results only. Let us train our young people to measure results by definite standards and create an attitude of mind that will not be satisfied with a passing grade. If and when we have established standards and can clearly prove to young people that the measured results are the basis for all records, their attitude will make possible the development of their special aptitudes and abilities. No one wants an 80-cent dollar, so why give an 80-per-cent efficiency when 100 per cent is the standard?

Finally, let us develop such standardized records that we may do justice to all students in evaluating work, estimating abilities, determining attitudes, and prognosticating futures. We may then save many a heartache, and avoid many a failure, by assisting those who are retarded, or those who have low IQ's, to prepare themselves for something within their capabilities which will allow them to earn a wage sufficient to live the life that was intended for them.



VOCATIONAL PRINTSHOP OF THE SENIOR HIGH SCHOOL, JOHNSTOWN, PA.
In this printshop, of which W. F. Cleaver is the instructor, some very striking typographical work is produced. Two of the late products are a catalog of a graphic-arts exhibit held in the school and a large souvenir program of the Johnstown high-school dedication.

DEVELOPING IDEALS THROUGH LETTERING

E. W. Manzer, Wisconsin High School, University of Wisconsin, Madison, Wis.

In the mechanical-drawing room there is an exceptional opportunity for the inculcation of ideals that will give the growing boy a better foundation for his fast-developing character. A new thought about the world at large, a keener vision of the problems of life, a deeper interest in the community in which he lives, all tend to awaken his mind to new and higher ideals. Many manual-arts departments have as their objective the character building of the boy. They have, because of this objective, planned their work with this end in view, and the results obtained are most gratifying.

Lettering sentences like "The quick brown fox jumped over the lazy dog," and "Now is the time for all good men to come to the aid of their party," have about as much educational value as did the 100 words we used to write when we had to stay after school. Efforts exerted in lettering sentences of this type might well be diverted into useful channels, thus vitalizing the course and also educating the boy to a higher level.

Without sacrificing technic it is quite possible to assign as lettering exercises, extracts from statements made by noted Americans, current topics of the community, little essays on character, politeness, safety first, and other things of equal interest and value. For example, take the article written by Dr. Frank Crane on profanity.

> "The young man of today who wants to succeed needs to take advantage of everything that may help him on. Swearing will be a black mark against him in any job he may have. Nobody wants a swearer in his office, in his workshop, or as his companion. To abstain from swearing does not mean you are a sissy. It simply means you are decent."

The psychology of a lettering plate like the above will more than educate the boy in mechanical drawing. It will have its effect on his character. True, it will not make him stop swearing, if he is addicted to that, but the point is that it will tell him something that might never reach him in any other manner. Another example that will open another thought channel in the mind of the young boy is expressed by Admiral William S. Sims, of the Navy:

> "If our boys and girls are to become useful and patriotic men and women, they must learn to be good citizens; that is, they must learn to respect authority, whether it is that of their parents, their school-teachers, or that of the policemen of their city; they must learn all they can in school, do whatever they can to improve their neighborhood, their town, and the great country to which they owe so many blessings."

The common grammatical errors of high-school students form another lettering exercise of equal value. The teacher of English will be glad to furnish sentences containing the common errors of her boys. It is quite common to hear "Him and I," or "We should have went." If we can clear up bad habits of any kind through the lettering exercise, we have accomplished something for the boys who are in our mechanical-drawing classes.

Our objectives in manual arts should take us outside of the walls of the school. The greater part of the boy's school life will be spent with a greater reward if we will but see the bigger objectives of teaching. It is for us to fit the work to the boy and not make the boy fit into a stereotyped course of study that has been given year after year. Somebody has said, *"It is not the mind, it is not the body, that we are training; it is the man, and we must not divide him into two parts."* The boy, who is to be the man of tomorrow, is the foremost factor in our vocation, and if we are to earn our salary we must build his character with the various types of educational material, properly used. Lettering as a means to this end, should not be overlooked by any department of manual arts, especially in those departments where the quick brown fox still jumps over the lazy dog.

A CINDERELLA IN EDUCATION

Laurence Parker, Kansas State Teachers' College, Pittsburg, Kansas

Do you remember the story of Cinderella? She was very beautiful—but let us forget that part of the story at this time. She married the prince—and we had best pass over this part of the story too. The part that we should be sure to remember is that she waited upon her more fortunate stepsisters. She worked morning, noon, and night to make their good times possible, and got mighty small thanks from her cruel stepmother and her selfish stepsisters.

There is a Cinderella in education which perhaps is not so badly abused as the one in the fairy tale, but which surely is not petted much nor pampered to any extent by the stepsisters. This Cinderella is vocational education. It is true that she gets a small annual legacy from her state and the federal government but not near enough to keep her well clothed and comfortably lodged in these days of high prices.

How on earth can anyone compare vocational education with Cinderella, you ask? Well, let us look at the whole scheme of education as it works today. We have three kinds of education, professional, cultural, and vocational. The first two are, or seem to be, stepsisters to the latter. When a country is young and struggling, and before there has been accumulated any amount of surplus wealth there is very little education and there is nothing at all in the public purse for the stepsisters to live on. But as the country gets more prosperous there is more and more money spent on colleges which prepare for the professions and for the cultural arts. This is as it should be, and we do not for a moment begrudge the stepsisters all the silks, satins, and lingerie that a wealthy nation can provide.

We have just shown that the stepsisters are provided for, out of the country's surplus wealth. Where does it come from? Cinderella provides it, and gets small credit in our busy world for doing so. "Surplus wealth comes," said Mr. Frank Cushman of the Federal Board for Vocational Education, "from work done upon natural resources. The more work and the better work that is done the more surplus wealth results and the more can be spent upon cultural education." In order that the work be done, workers must be trained. Where the work is professional in character, the stepsisters turn to and help, but we are told that less than six per cent of the work of the nation is such that the stepsisters can and will undertake to do it. It means by this that less than six per cent of the nation's work is professional in character.

The other ninety-four per cent of the work necessary to produce surplus wealth is the result of work of all sorts from laboring with the hands to a combination of hand and brain. Men and women are being trained to do this work every day, for the work of the world never stops. The ranks of workers become depleted and must be filled. Somehow, some way, often by a very haphazard and wasteful method the training goes on and the ranks are filled with workers of varying skill.

It has been found, however, that the Cinderella of education, is able to train these workers more effectively, and in less time, than they could be trained in any other way. Whenever she has been able to make her small legacy cover the job, she has added tremendously to the surplus wealth of the country and made available more fine feathers for her fortunate stepsisters. In one state the legislature at one session appropriated about seven million dollars for the state colleges and universities and provided hesitatingly eight hundred thousand dollars for the care of Cinderella who waited upon them. We do not want to take a single dollar away from the stepsisters, but we do think it is about time that our states loosened up the purse strings and gave Cinderella an outfit that will make her at least a well-dressed and contented lady's maid to her stepsisters. You may be sure that she will pay back, with interest, all the money that is spent on her, by making her own work more effective and far-reaching. Cinderella may not be a very lucky girl, but she is a plucky girl, and will pay big dividends on money invested in her if her parents will only do their part.

INDUSTRIAL-ARTS MAGAZINE

EDITORS

E. J. Lake *S. J. Vaughn* *J. J. Metz*

AN INFRINGEMENT OF COPYRIGHT

The mimeograph has proved a great aid in supplying teaching material for class use on a rush basis. Hundreds of teachers have speeded up classwork and stimulated interest in class projects by the distribution of job sheets, sketches, diagrams, etc.

Last fall a teacher in a school found himself confronted with the task of organizing a hurry-up course in electricity. The supervisor was insistent in his pressure for a new and simple course. The teacher knew a text with much good material that was usable but objected to its introduction upon the ground of price and unusable material.

Very adroitly he called to his aid the school mimeograph. Page after page of the text and illustrations was copied. The material was then distributed for class use and the teacher never thought for a moment of the injustice he had done to the author and to the text which had pioneered a most difficult subject in a most constructive way.

The teacher when asked about the matter seemed entirely oblivious of any wrong. He had never thought that federal court action was possible in the matter. He had never thought that damages are collectible and that the action would drag into the discussion the local school board, the principal of the school, the pupils, and the mimeograph operator.

Publishers as a group are very liberal in extending courtesies for the quotation of copyright material. As a matter of professional courtesy the average author is highly complimented in a reference to constructive material accepted as standard. Copyright suits are rare because federal action is never begun except upon evidence of gross violation and the penalty is positive and drastic.

The problem of filching teaching material is up for discussion in a number of quarters. Some day the slip may cause very serious embarrassment to a most innocent teacher. The court will study the violation purely as a violation and adjudge damages. The court will interpret the intent of the copyright law as a protection for the product of the brain of a fellow teacher. This violation of a federal law is widespread and flagrant, and the consequences are serious and humiliating.

SELF-EXPRESSION AND TALENT

There is no greater hindrance to art instruction than the prevalent conception that art concerns only the talented few.

We sometimes wonder whether the teacher of art, who coerces the dull pupil by comparing him disadvantageously with the apt member of the class, is not doing injustice to both.

Comparisons of this sort should be discovered by the pupils themselves. Art impressions are caught rather than taught.

As the teacher progresses with the problem of bringing to the attention of pupils conceptions of propriety and beauty, the exactions of art become evident.

Since no art is chaotic, it may not be produced by haphazard methods. The artist may never depend on accident for results.

Thoughtful, careful, painstaking effort may not always produce a great work of art, but great art is never produced without such effort.

Great works of art, on the other hand, do not display the painstaking labor required in their production. The work of art must appear as if spontaneous.

Now self-expression is spontaneous. Self-expression is expression of the individual self; it exposes the individual.

The inspirational art teacher, like the inspirational coach, can lead ordinary pupils to do extraordinary things on occasion.

Now is the time for commendation. A little boost at the right time will bring about a renaissance. The art teacher must be a strategic booster.

GOOD LANGUAGE AND VOCATIONAL PURSUITS

An engineer in the marine world recently impressed his contemporaries with the suggestion that the employment of good language was a factor in vocational pursuit. He deplored a loose, slangy and inelegant phraseology, and pointed out that in dealing with his fellow man he must be able to express himself in clear, clean and concise language.

Several years ago the writer listened to an inventor who sought to enlist capital for the development of a new mechanism. He addressed a body of business men who stood ready to invest their money if they could be convinced that the scheme was meritorious. There were those who believed that the scheme was a good one.

The inventor, however, employed language which was full of slang, boast and bluster. He was evidently a mechanic who understood his job, but he weakened the confidence of his listeners by his speech. His scheme was rejected. The judgment was that while the project was good, the man was not.

The chief engineer of a leading aeroplane-motor manufacturing plant recently addressed a body of 500 engineers in explanation of the latest type of motor employed in trans-ocean travel. He held his audience spellbound for two hours. Was it eloquence, oratory or personal charm? No, it was merely the language of a man who knew his subject and who modestly expressed himself in simple and expressive terms.

The engineer who spoke his mind on the use of language in the *American Marine Engineer* said: "It is the mysterious yielding of something that causes the first impression of others to be pleasant or unpleasant, the attributes of apparel and manner of speech being contributory factors. Of these two, the latter is the more potent, for at times the dilapidated raiment of the mendicant is obscured by the mantle of refined and correct language.

"It would be a remarkable incongruity for a man to don conventional evening clothes and omit the appropriate dressing of his feet, yet no more incongruous than to be clothed with punctilious detail and then express himself in the vernacular of the street.

"The artisan, with the necessary tools, shapes material into the commodity desired. With thought as the material, words are the tools by the use of which it is expressed. It is essential that the mechanic exercise care in the selection of tools that shall be appropriate for the service required, and the same consideration should be given to the selection of words with which to shape thought into expression.

"While the prolific use of slang of the period may be comprehensive and interesting, it is never impressive, excepting to demonstrate the ability of the speaker to use it.

"The constituent qualities of fine raiment as between savagery and civilization are at variance, but the desire for it is universal. It is pleasing to the sight, and what apparel is to the eye fine language is to the ear."

In comment thereon it may be said that it is not so much a question of employing refined or elegant language as is the use of simple and expressive language. The man who deals with the physical things naturally resorts to technical terms and short-cut expressions. If on the one hand oratorical flights are out of place, the use of slangy and uncouth terms is equally

improper. The English language is sufficiently pliable to permit description of every form and condition and a complete expression upon every situation and fact.

THE VALUE OF A MAN'S WORD

There is, perhaps, no more unworthy nor troublesome person in the field of education, than the teacher who holds his position in an institution or system until just before the time for opening and then withdraws on account of greater inducements elsewhere. Many such persons do not offer their resignations and await the reaction of the proper authority. They accept the proffered positions and notify the authorities of their withdrawal.

A teacher in the midst of such a procedure recently said, that he "pitied the man who would not break his word for his own advancement."

The present lenient and considerate attitude of school authorities toward their teachers makes such a selfish and inconsiderate attitude, on the part of a teacher toward his legal obligation, peculiarly reprehensible. It is difficult to find an educational institution or system that would not grant a release to a worthy teacher in case his or her own welfare and advancement were involved in the offer of a position, provided the request for release were presented in proper manner and within reasonable time before the actual beginning of his duties.

There are those who are old-fashioned enough to believe that in the long run a person's welfare and progress are not promoted by broken faith, ignored promises, and unfulfilled obligations.

If there are cases, as there are, where teachers at rather inopportune times are called to higher and better positions without the seeking of the persons involved, then duty to themselves and to their employers demands that they present the matter fully, frankly, and fairly to their employers, and ask their cooperation in the solution of the problem presented. Then to the new friendships formed in the new position will be cemented the tried and true friendships formed in the old position.

A man's word is worth more than a few dollars. His reputation for square dealing is worth more than the difference in salary between any two positions that the average schoolman may be called upon to consider. New positions seek the man who has been successful and *square* in the old ones.

KNOW WHAT TO DO

Have you ever watched the waiter in the railway diner as he deftly places a fresh cloth over your table before he serves your dinner? Have you noticed the nicety with which the job is commenced, the surety with which each succeeding movement is carried out, and the precision with which everything falls into its proper place?

Simple as this task may seem to the onlooker, yet its performance bespeaks planning, method, forethought.

Teachers probably resent comparisons between the requirements of their profession and the demands of an occupation like that of the waiter. Yet, does it make any difference what the job may be if we discuss the matter of definitely planning the doing of the job? It is true that a complicated job requires a different preparation from that which must be made for a simple job, yet both require preparation and the amount of preparation differs only in degree.

If some industrial-arts and vocational-school teachers had the movements required efficiently to start and close their classes as well analyzed and planned as the railway waiter has his job of spreading a tablecloth, there would be less complaint about noisy and unruly classes. A boy who is not kept busy at all times with something that is worth while in his estimation, is a potential source of trouble. It is the teacher's job, then, to see that the boy is occupied. That means that the teacher himself must know just what to do and what he wants his students to do. There must be no sign of hesitation at any time. Every movement must be definitely planned, every eventuality foreseen. This means analyzing our work first, and then planning to meet the conditions disclosed by the analysis. It requires forethought, the power to foresee, to plan ahead.

ORIGINAL INVESTIGATION

A common experience with high-school graduates on entering college is that they have been helped overmuch in their high-school work and have not learned to study and work without constant assistance.

Thrown on their own resources for the first time in college, the freshman is obliged to deal with assigned topics of study and not with definite pages of a definite text.

Some school subjects are readily formulated under a set of graded exercises. Manual training has been so formulated and the subject has become little more than a shop routine of doing things as directed by the teacher. With the addition of work in various materials and the restrictions of time for the work, this set of graded exercises have been divided into courses which deal with particular kinds of work but with little more original study of the subject.

Two opportunities are offered the manual-arts teacher who is confronted with increased subject matter and limited time. He must either divide the subject matter and attempt only a limited field of instruction, or he must weld the whole field of instruction into a general course with less specific practice.

In view of the purpose of manual arts in contrast to the purpose of vocational training, either of these plans should be made opportunities for study and investigation rather than a series of shop exercises.

We can readily imagine a fine educational procedure which has for content the use of only one kind of material.

We can readily imagine a finer educational procedure which has for content the use of several kinds of material and which has the purpose of interesting and informing the pupils in their effective use.

In every subject of study there should be opportunity for original investigation with least arbitrary restriction. Field trips have become essential to school instruction in all lines of study. Students of all subjects should be required to observe and report on examples of the kind of work they are doing and so become acquainted with conditions that exist in their own community. This spirit of investigation should be developed.

Vocational Guidance

It is hazardous for anyone to assume that he can arbitrarily train a boy for any calling that may be selected. The latter's peculiar temperament calls for the strictest consideration, so that the work may be suited to the boy and not the boy to the work. His instinctive disposition and native ability need to be consulted and their promptings specifically heeded. Every boy is a natural-born something or other worth while. To discover this predominant trait, to foster and indulge it throughout the training course, and finally to start the young man upon his lifework—this is a condensed statement of the entire problem of the vocational guidance of youth.—*Wm. A. McKeever.*

EXAMPLES SHOWING HOW VARIOUS TYPES OF MILLING CUTTERS ARE USED

Howard Rowland

ONE OF THE leading vocational schools in the middle west has followed the practice of installing machine tools which the boys will use later on when they take their place in industry. Actual examples which parallel those milling jobs which are found in the actual machine shop, are worked into the school-shop course, and the work is so planned that during that period of the year each boy has an opportunity of operating and familiarizing himself with all types of milling operations.

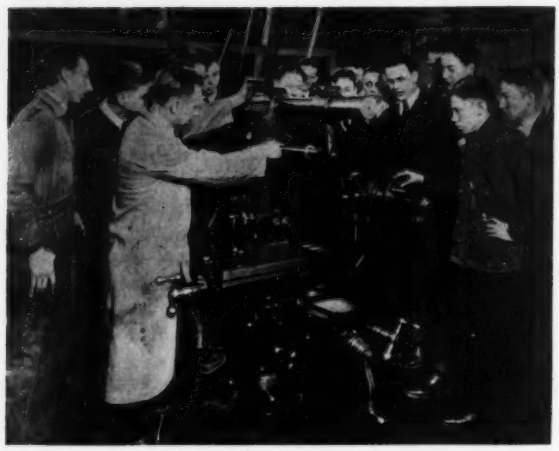


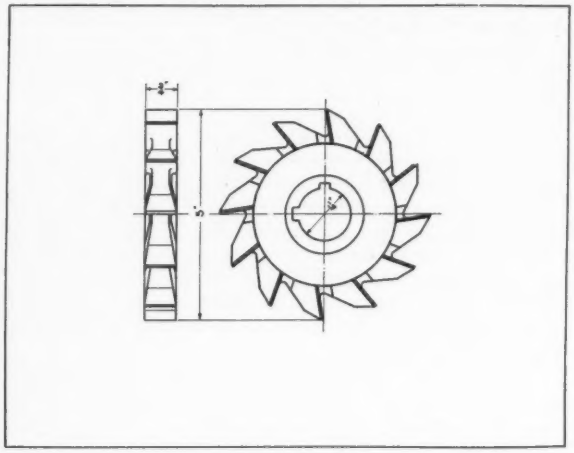
FIG. 1. PRELIMINARY DISCUSSION ON GEAR CUTTING.

In addition, the lecture and demonstration method has been used with success, and a short preliminary discussion helps to clarify the subject before the boys themselves begin on actual work. The students are cautioned in the use of the machine, the various control levers are thoroughly explained, and the safety features pointed out.

The illustrations which follow show various types of cutters which are used during the course. Illustrations which have been taken in actual machine shops are used during these discussions and serve to sustain the boys' interest. The parts shown in these illustrations are, of course, not usually available in the school shop, but parts of a similar nature can be secured from local foundries or machine shops. Some milling-machine manufacturers are prepared to supply castings for the use of students.

FIG. 2. SHELL-END MILLS AT WORK.

Investigation has shown that not infrequently costly and up-to-date machine tools stand idle for a considerable portion of the time, because no one has found it possible to work out details for shop courses.

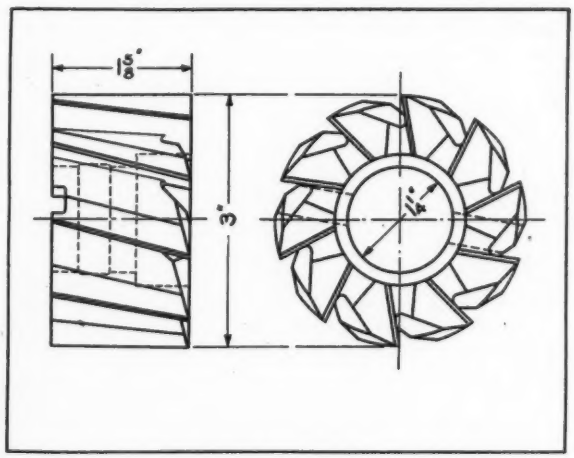


SLOTTING CUTTER.

A study of the following illustrations will probably give the teacher some helpful information which he can use in improving his own shop course in milling.

Shell-End Mills on Duplex Miller

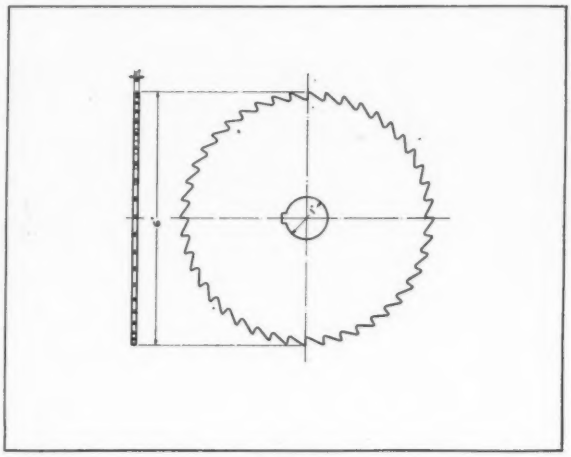
The shell-end mill is one of the most widely used cutters in a machine shop and is admirably suited for a job of the kind shown in Figure 2. Here is a frame casting on which both sides are being milled at the same time by means of duplex cutters. A special fixture is mounted on the machine table and holds one piece with the bosses or portion to be milled in a vertical plane. As the table advances to the cut, it is tripped automatically by a dog at the side of the table which operates the control lever, and the table is slowed down from the quick traverse rate of 100 in. per minute to the feed



SHELL END-MILL.

rate of 22 9/10 in. per minute. Automatic machines of this kind are used extensively in the automobile industry and where high production is required at low cost. This particular part is a frame used in a talking machine of international reputation.

Machine: 24-in. duplex automatic
Name of part being machined. Main frame casting
Operation: Mill bottom and two rows of bosses on top
Material: Cast iron
Time per piece: .80 min.
Stock removal: 1/16 in.
Cutters: Three 2¼-in. diam. shell-end mills on 3 special stub arbors
Speed: 130 r.p.m.
Feed: 22.6 in. per min.



SAW.

Face Milling Large Surfaces (Fig. 3)

Any block of cast iron can be used and cuts of varying depths taken depending upon rate of feed. On this job the accuracy required is not great and for this reason only one cut was taken at a comparatively slow speed. No special fixture was used to hold the rough casting.

Machine: No. 2 M plain miller
Name of part being machined: Body-pump

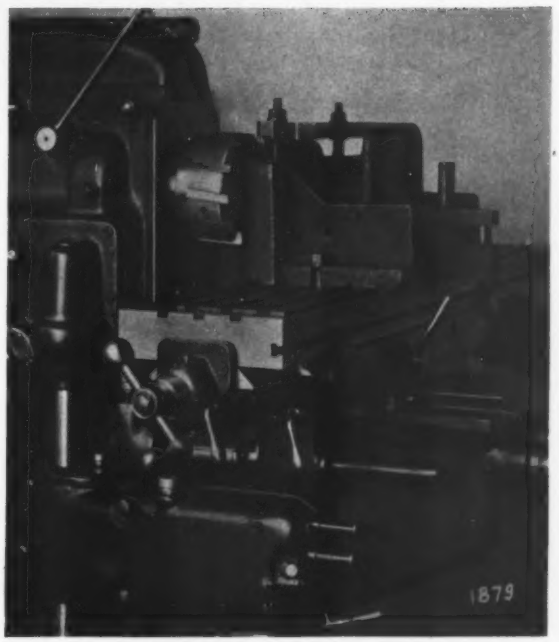
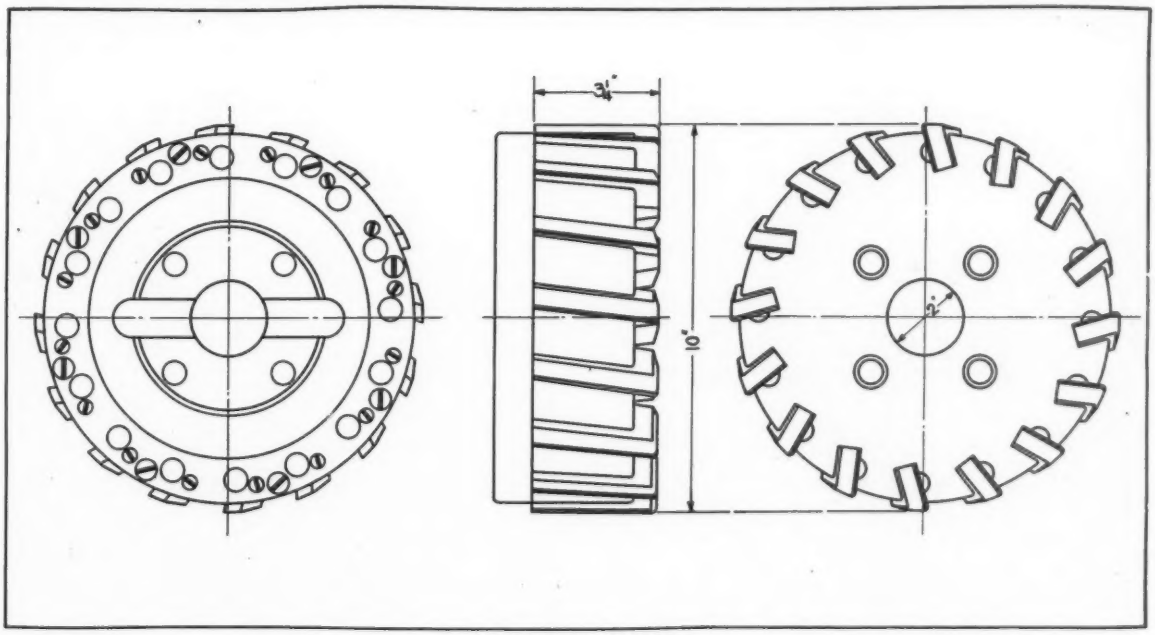


FIG. 3. FACE MILLING LARGE SURFACES.

Operation: Mill bottom
Material: Cast iron
Time per piece: 6.4 min.
Stock removal: 3/16 in.
Cutters: 8 H. P. face mill
Feed: 5½ in. per min.

Sawing Hinges from Formed Stock

The sawing of metal (see Fig. 4) requires extreme caution for the nature of the cut frequently determines the width and diameter of the saw which in turn limits its capacity. When cutting steel as in this case a heavy flow of cutting lubricant must pass over the saws to carry away the heat and also to keep the cut free of chips. This illustration was taken in the plant of a leading hinge manufacturer and shows the



FACE MILLING CUTTER.

application of a special work-holding device called a fixture. Two fixtures are used—one on each side of the gang or group of cutters. As the pieces are sawed off on one side the operator is removing the finished pieces from the other fixture and pushing the bar stock in place getting ready for the next cut. Any block of cast iron or steel can be used for an example of the use of a milling saw.

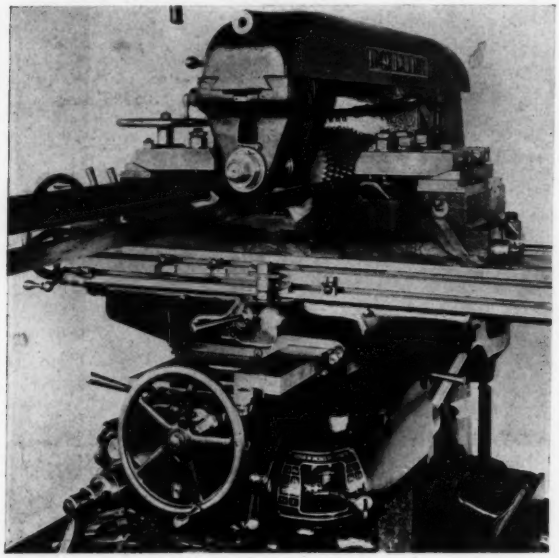


FIG. 4. AN APPLICATION OF THE USE OF SAWS.

Machine: No. 4 plain high-power miller
Name of part being machined: Male and female hinge straps
Operation: Saw off from bar
Material: Cold-rolled formed bar stock
Time per piece: .0837 min.
Stock removed: $\frac{3}{16}$-in. saw cut from solid
Cutters: Eight 8 in. diam. by $\frac{3}{16}$ in. saws, with side teeth
Speed: 80 r.p.m.—186 ft. per min.
Feed: $3\frac{3}{8}$ in. per min.

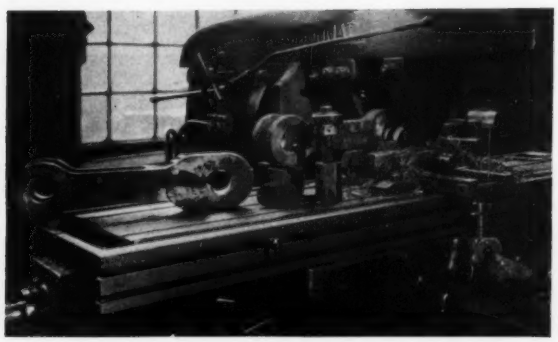
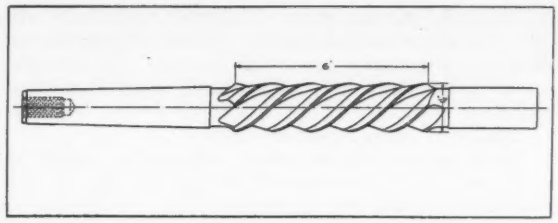


FIG. 5. A HELICAL MILL JOB.

Helical Mill on Railroad Work

Machine: No. 5 plain high-power miller
Name of part being machined: Eccentric rod
Operation: Mill yoke (see Figs. 5 and 6)
Material: Steel forging
Time per piece: 15 min.
Stock removed: Solid
Cutters: Special helical mill $2\frac{3}{8}$-in. diam.



HELICAL MILL.

The helical mill is generally employed where steel forgings are to be milled from the solid and in the modern railroad shop you will always find this type of cutter employed on work similar to that shown in the foregoing photographs. A tremendous supply of cutting lubricant must be thrown over

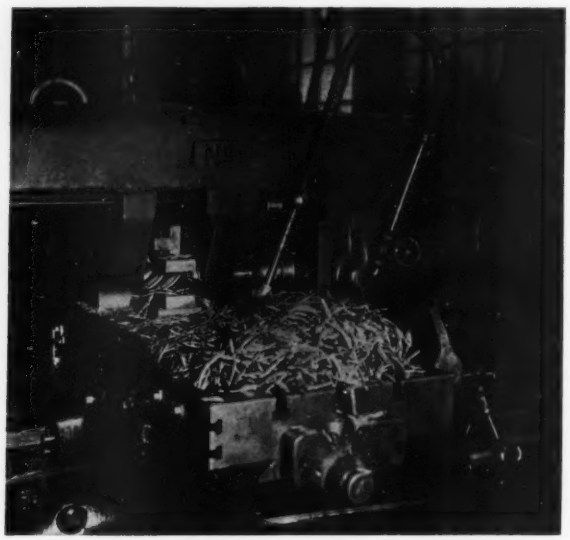


FIG. 6. ANOTHER VIEW OF HELICAL MILL AT WORK.

the cutter. Note the pile of chips, which gives an indication of the amount of metal removed on cuts of this kind. A helical mill produces a distinctive type of chip, which is always recognized. It is necessary to drill a hole through the solid section to permit the starting of the cut with the helical mill.

A Pair of Helical Mills

Helical mills are perhaps the best known and most widely used cutters in the machine shop. For all straight milling,

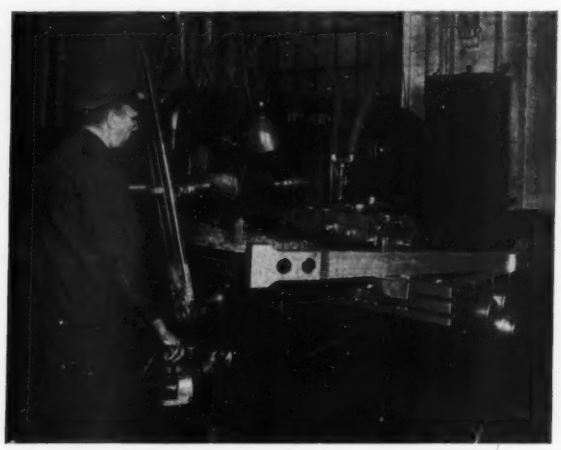
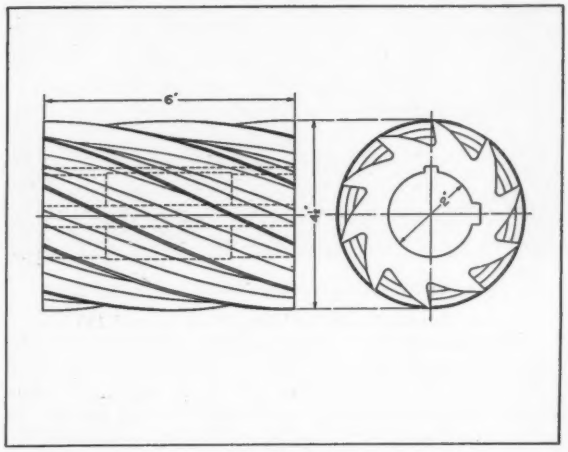


FIG. 7. A HELICAL MILLING JOB IN A R. R. SHOP.

cutters of this kind are employed. Note the fact that the teeth of the cutter are widely spaced. This is a decided improvement brought about by recent tests, showing the advantage of the wide-tooth cutter over the old style narrow or closely spaced tooth type. All cutters must be properly ground to produce the maximum work and to make certain that the machine in which a large investment has been made operates at maximum capacity and efficiency. A simple problem in spiral milling can be illustrated by taking any block of steel or cast iron and milling the sides, using varying depths of cut and rates of feed.



HELICAL MILL.

Machine: No. 5 plain high power
Name of part being machined: Lap and lead lever
Operation: Mill sides (see Fig. 7)
Material: Steel forging
Time per piece: 5 min.
Stock removed: ¼ in.
Cutters: Spiral mills 3½ by 6 in. long
Feed: 4 in.

Cutting Three Types of Gears

One of the most interesting and instructive types of milling which can be handled in a machine shop is that of cutting gears. Figure 8 shows how spur gears are cut on the miller; Figure 9, helical gears; and Figure 10 shows how the teeth on a worm wheel are gashed before the gear is hobbed.

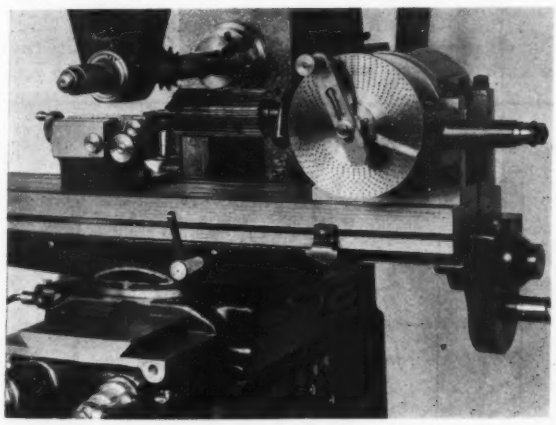


FIG. 8. CUTTING SPUR GEARS.

Gear blanks of cast iron can be secured from any machine shop and instructions for the cutting of gears as supplied by all milling-machine manufacturers can be used to work out actual machine-shop examples. Needless to say, a universal

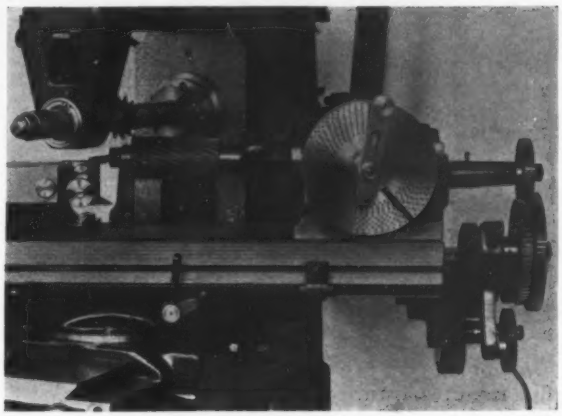


FIG. 9. CUTTING HELICAL GEARS.

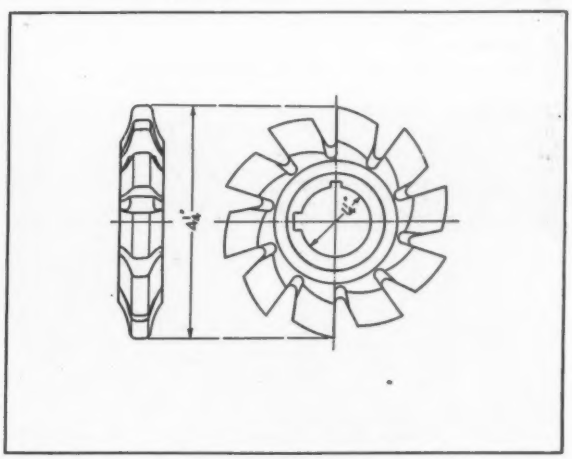
knee and column type miller is employed and the use of the index or dividing head is brought into the course of instruction.

Helical-End Mill on Vertical Miller (Fig. 11)

There are certain jobs on which it is necessary to use helical-end mills and these likewise are among the most com-

FIG. 10. GASHING A WORM WHEEL.

mon cutters found in the average shop. The job shown here is a high-production job on which the pieces are held in a circular milling attachment, each piece being clamped separately. All that the operator has to do is load and unload



GEAR TOOTH CUTTER.

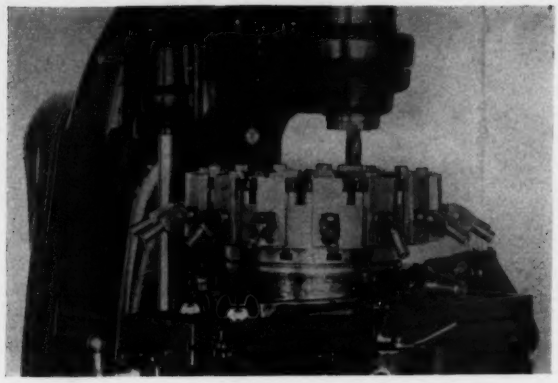
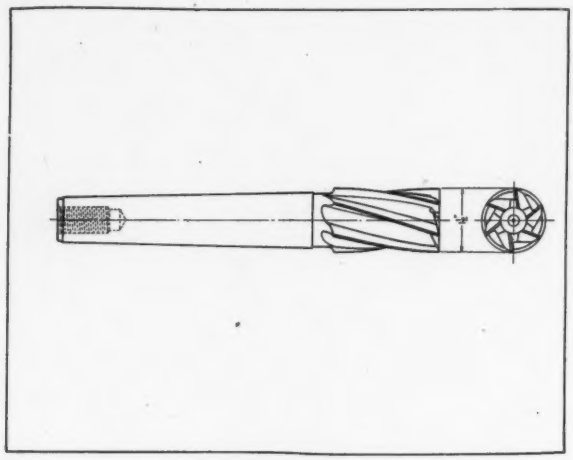


FIG. 11. A HELICAL-END MILL ON A VERTICAL JOB.

the fixture. As the table revolves the pad to be milled is brought under the end mill which is running at a high rate of speed. End mills not only cut on the end, as indicated by the name, but also on the periphery and therefore can be used for reaching in to mill the bottom and sides of recessed surfaces. Cutting tests can be made on standard cast-iron test blocks.



HELICAL END MILL.

Machine: No. 1 M vertical miller with ¾ to 30 feed gears
Name of part being machined: Magnet clamp
Operation: Mill face of main boss
Material: Brass
Time per piece: .078 min.
Stock removed: $\frac{1}{16}$ in.
Cutters: One 1½-in. diam. helical-end mill.

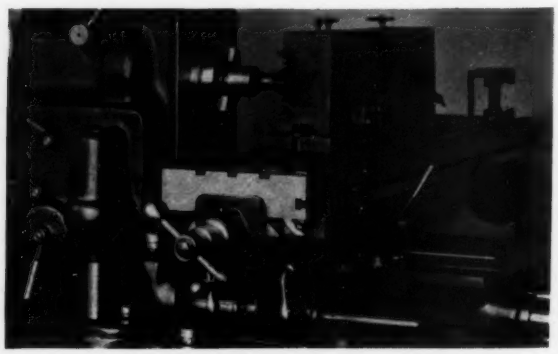


FIG. 12. AN ANGULAR CUTTER FOR A SPECIAL JOB.

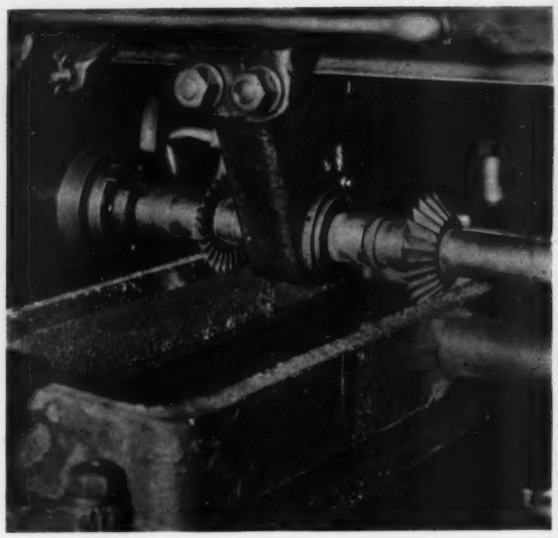


FIG. 13. ANGULAR CUTTERS SAVE OPERATIONS.

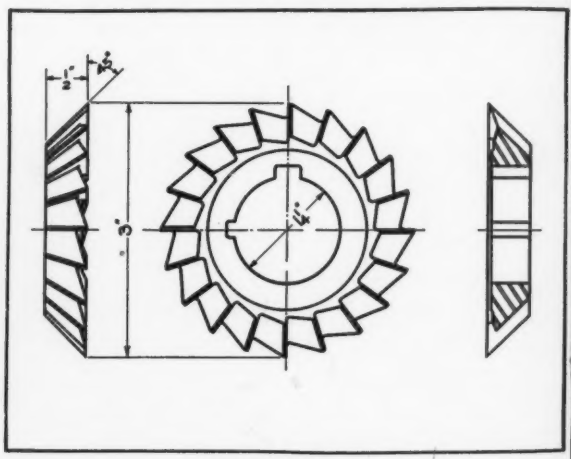
Angular Cutters Help Here (Figs. 12 and 13)

Many jobs could be handled quicker and faster if angular cutters were employed more freely. In Figures 12 and 13, it can be seen that jobs can be finished at one cut, whereas, without angular cutters the same operation may require several cuts and perhaps the use of a different type of machine or a slotting attachment. Angular cutters may be made in all sizes and shapes and are frequently made on special order to meet the requirements of the job in hand. Every shop course on milling and cutting should include several examples of angular milling. Here again a simple test block can be used or some local manufacturer can supply parts which may be milled. By putting angular cutters on the locomotive job shown in Figure 11, 60 per cent was saved in the machining time over the former method of planing this piece.

Machine: No. 2 M plain miller
Name of part being machined: Block-swiveling
Operation: Mill dovetail
Material: Cast iron
Time per piece: 16.1 min.
Stock removed: $\frac{1}{8}$ in. to $\frac{3}{16}$ in.
Cutters: 2½-in. diam.—60-deg. H. S. S. cutter.
Feed: 5½ in. per min. rough; 2⅜ in. per min. finish

Form Cutter Paired with Helical Mill

When special contours are to be milled, form cutters must be used. Figure 14 shows a combination consisting of a form



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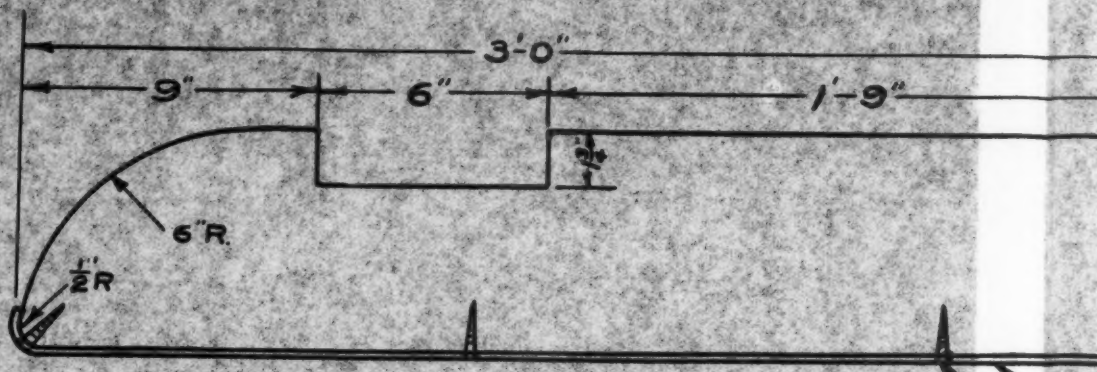
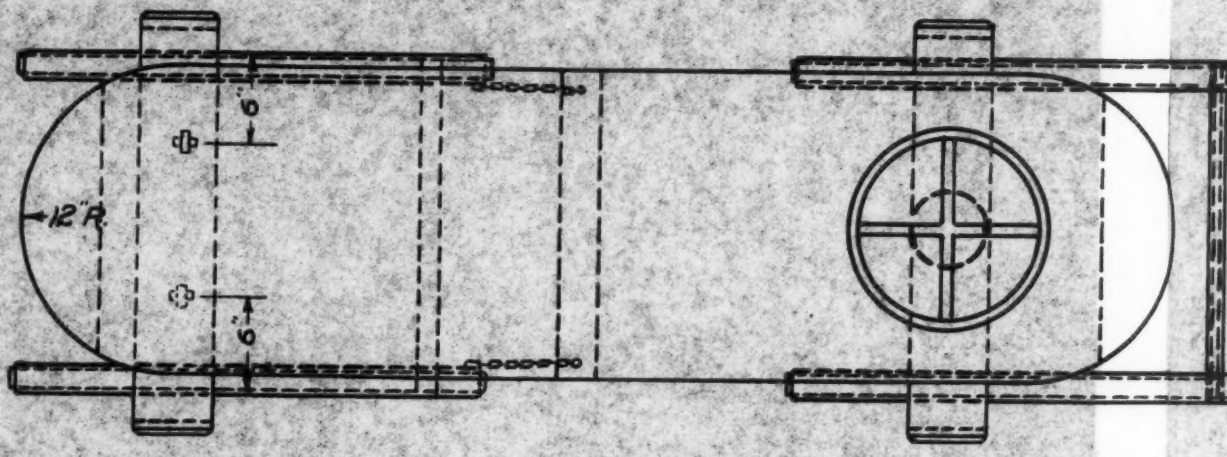
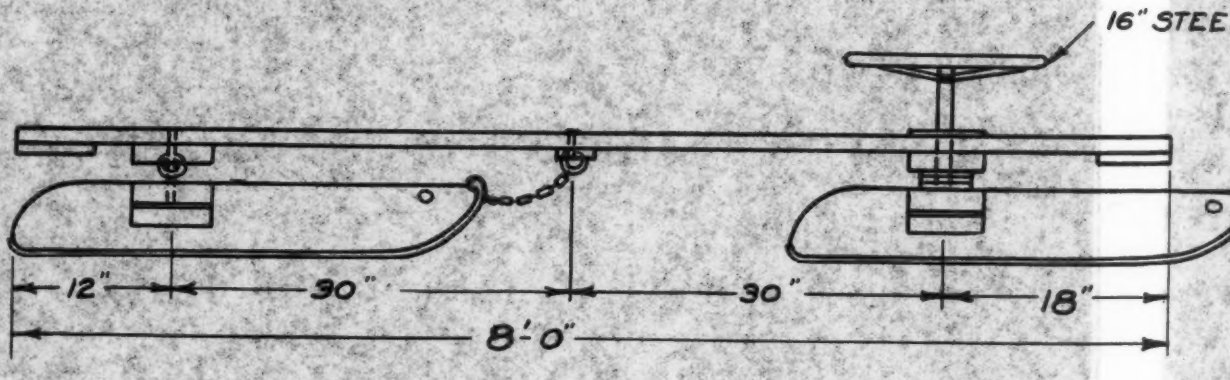
TRACING SUPPLEMENT No. 81
THE INDUSTRIAL-ARTS MAGAZINE
JANUARY, 1928



DETAIL OF RUNNER
SCALE - 3" = 1'-0"





AUTOMOBILE BOB SLED

UNIV OF WICH

Designed by M. C. Keenders, Fond du Lac, Wis.

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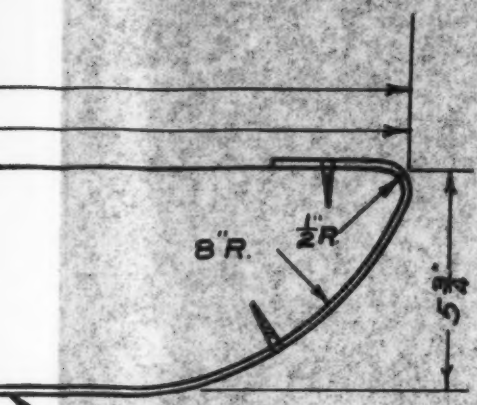
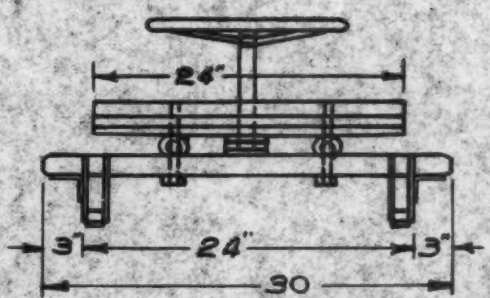


⅛" X 1¼" BUGGY TIRE STEEL

1¼" WOOD SCREWS - 5 NEEDED

6" STEERING WHEEL



SLED PLAN 2.

UNIV. OF MICH.

M.C.K.

For Details See Page 26, Industrial-Arts Magazine, January, 1928.

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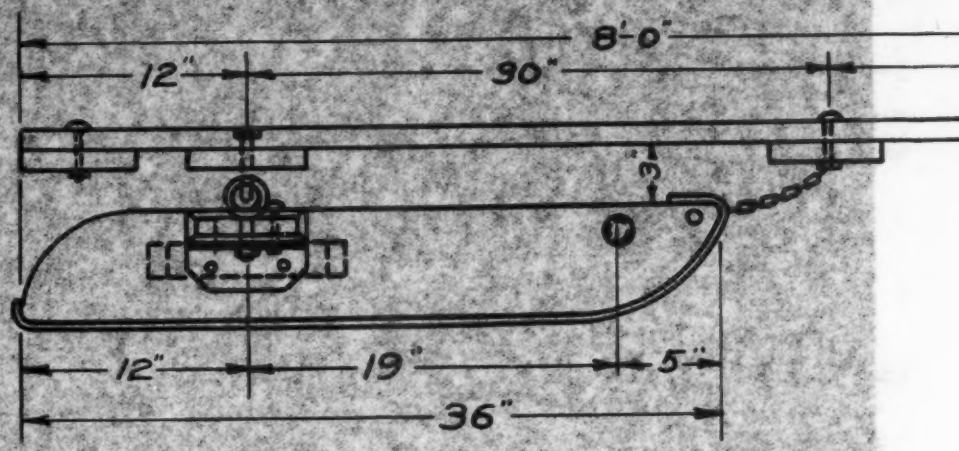
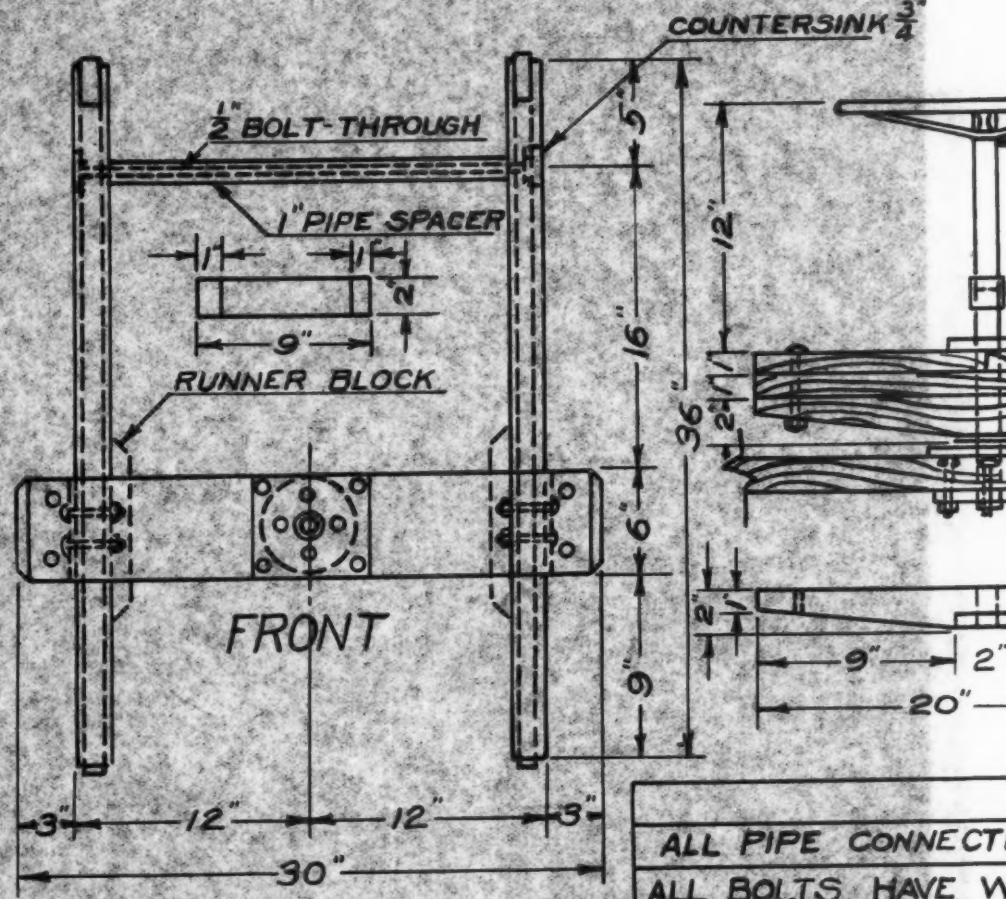
THE INDUSTRIAL-ARTS MAGAZINE
JANUARY, 1925





ALL PIPE CONNECT
ALL BOLTS HAVE W

AUTOMOBILE B

UNIV. OF WISCONSIN

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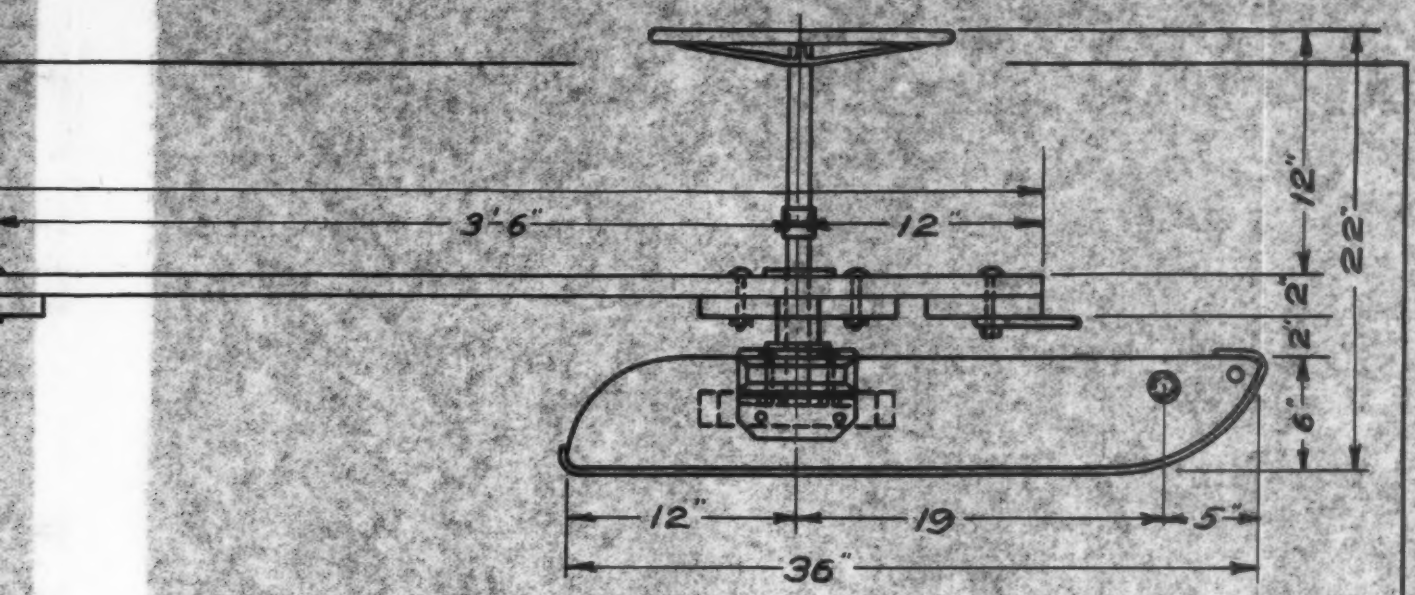
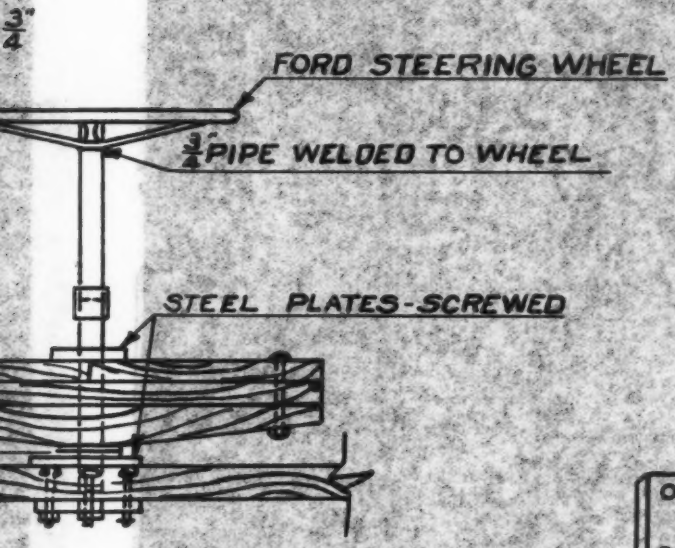
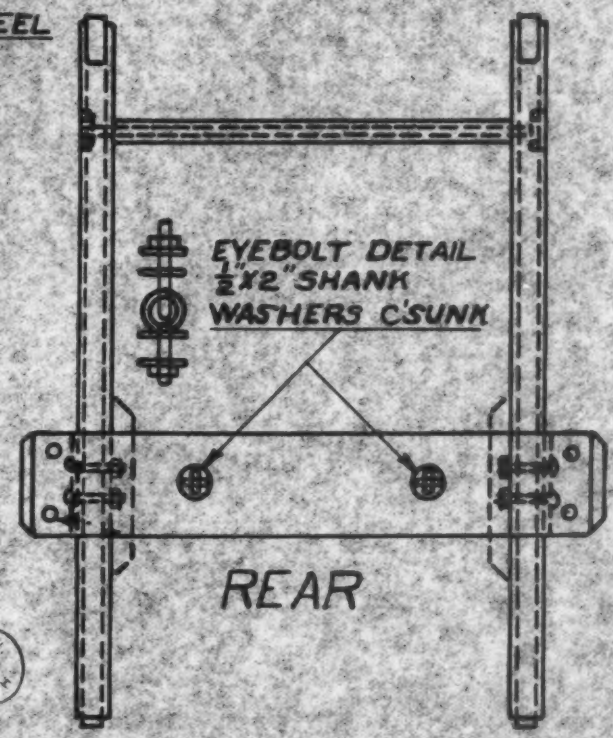




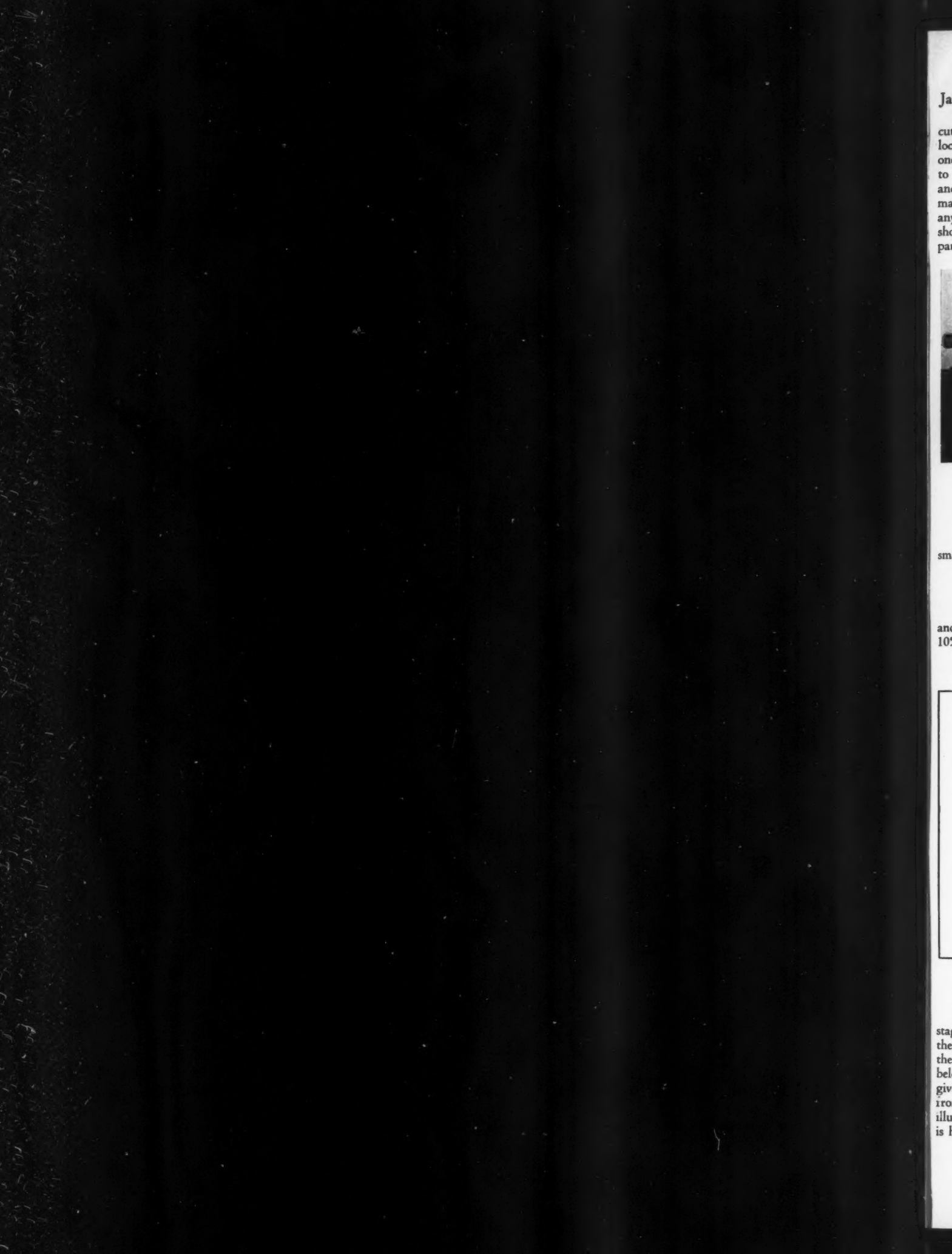


NNECTIONS WELDED.
AVE WASHERS.

FRONT AND REAR INTERCHANGEABLE
2"X6" OAK USED IN RUNNERS AND PLANKS
1" OAK USED IN RUNNER BLOCKS

LE BOB SLED PLAN I

For Description See Page 16, Industrial-Arts Magazine, January, 1928.



cutter and a regular spiral mill. This entire job—a key on a locomotive—is handled by a milling machine in the shops of one of the large eastern railroads. Form cutters also are made to special order to take care of particular surfaces to be milled and usually save many times the initial cost in reducing the machining time. Form cutters have a variety of shapes and any shape may be used for instruction purposes in the school shop. A standard test block of cast iron can be used, or some particular casting can be secured for this problem.

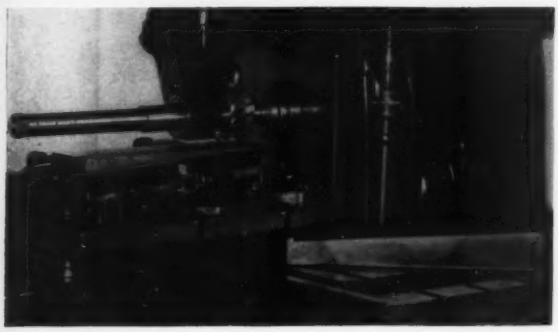
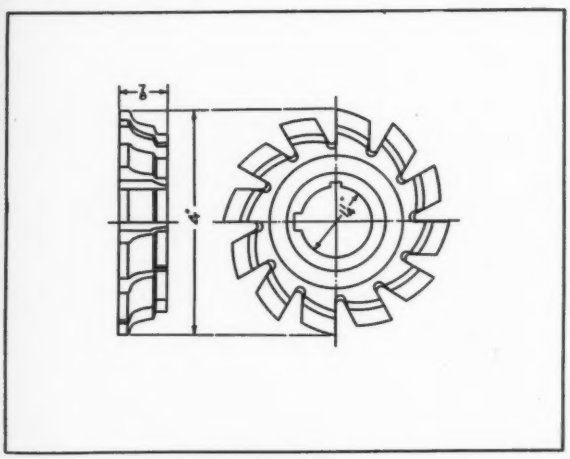


FIG. 14. GANG OF FORM CUTTERS AND HELICAL MILL.

Machine: No. 5 plain high-power miller
Part name: Key
Operation: Mill end of taper and form mill lip on small end
Material: Steel forging, .40 carb.
Time per piece: .90 min.
Stock removed: $\frac{3}{16}$ in.
Cutters: One 5½-in. diam. by 1½ in. wide half side mill and one 5½-in. wide special form cutter on 1½-in. arbor No. 105
Speed: 52 r.p.m.
Feed: 4½ in.



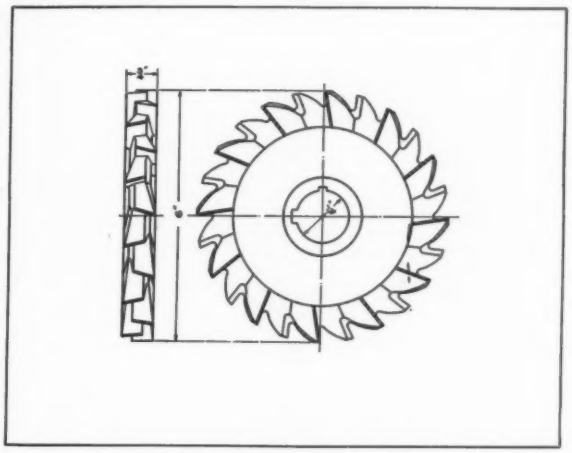
FORM CUTTER.

Staggered-Tooth Slotting Cutter

Where large slots must be milled, as shown in Figure 15, staggered-tooth slotting cutters are employed. Sometimes they are in the nature of inserted tooth cutters as shown in the illustration, and sometimes solid, as shown in the sketch below. Staggering the teeth helps to break up the chips and gives a more efficient cutting action. Slotting cutters range from very small keywaying cutters to the size shown in this illustration and sometimes larger. The particular job shown is handled complete on a milling machine, eliminating the use of a slotter and a planer and at the same time reducing the machining time 50 per cent. A variety of examples of slotting cutters should be used in the machine shop including the cutting of keyways and of larger slots as illustrated in Figure 13.

FIG. 15. A DIFFERENT TYPE OF SLOTTING CUTTER.

Machine: No. 5 plain high power
Name of part being machined: Crosshead
Operation: Mill guide slots
Material: Steel casting
Time per piece: 3 hrs.
Stock removed: Solid
Cutters: Gang consisting of 10-in. and 12-in. diam. slotting cutters.
Speed: 20 r.p.m.
Feed: ¾ in.



STAGGERED TOOTH SLOTTING CUTTER.

Conclusion

The foregoing series of articles is prepared to suggest to instructors in machine shops of schools and colleges a different approach in the preparation of their milling-machine courses. While nothing has been mentioned about the grinding of the cutters, this important phase of the work must not be forgotten. The writer feels that the milling-machine work can be made much more interesting by giving an industrial interpretation to every problem which the student takes up in his shopwork.

PROBLEMS & PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine-shop practice, turning, patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration.

FLOWERPOT RECEPTACLE

C. Anthony Van Kammen, Grand Rapids, Mich.

This is a practical problem for junior-high-school classes in designing contours and surface enrichment. The construction involves the use of various types of woodworking machines. If the subject is taken up with the art supervisor early enough in the semester, problems to be made in the woodshop can be designed and decorated in the art department, thus giving the art student a concrete application of the principles of design that he has been studying. Sketches or blue prints of such problems should be placed in the hands of the art department and if possible include a full-size finished example. Designing and planning the contours and surface enrichment should involve the making of a full-scale working drawing. This should be followed by a second plate, full size, in tempera colors, showing one side, in this case of the flowerpot receptacle in the color to be used. Send the completed drawings to the woodshop. Here a stock bill should be made out and material cut for as many receptacles as are needed.

A stock bill of the problem offered follows, with dimensions for finished sizes:

4 pc. 6¾ x ¾ x ¾	Corner posts, basswood
4 pc. 7¾ x 6¾ x ¼	Panels, basswood
4 pc. 6⅜ x 2½ x 1/16	Top panel trim, cardboard
4 pc. 5½ x ¾ x 1/16	Bottom panel trim, cardboard
1 pc. 6¼ x 6¼ x ½	Bottom, basswood

Figure 1 shows a working drawing of the flowerpot receptacle. The sizes of the top and bottom panel trim will vary with the designs. The corner posts and panels, unless a receptacle is designed for a special flowerpot, will be the same for all the members of the class. These may be cut in quantity lots for the entire class, so far as length and width are concerned, by an advanced member of the class or by the instructor. Cutting the sides of the panels at the proper angle may be done by each boy for himself. The four pieces are nailed together with brads at the top and bottom where the nail holes will not show. With the universal miter gauge set at the proper angle two cuts will finish the sides. After tracing the outline or contour of the top edge of the panels, the work is taken to the band saw. Be sure that the upper contour is drawn so that both sides of the panel are equal in length. Trace around the contoured panel end to check the band-sawed edge with the original design. Very often this is changed by careless band sawing and requires a slight change in the design before the cardboard panel decorations can be traced and cut. If correct, trace the complete design on the cardboard. Fasten this with thumb tacks to a smooth pine board and cut out the designed pieces with chisels and carving tools. Glue and brad them to the panels. Place a piece of paper between each and clamp the four panels between two smooth boards of proper size.

While the panels are drying the grooves in the four posts may be cut. Place the two outside dado cutters on the saw to cut a ¼-in. groove 1/16 in. deep. Mark on the fence and the saw table, with a red pencil, the place where the saw points, farthest away from the worker, project through the table top. This is the forward cutting edge or point of the saw. As the grooves do not go the entire length of the corner posts, the upper ends of the grooves will have to be marked on a post. This mark must be even with the marks on the saw table and fence as the piece is let down on the saw table to be grooved. To do this without danger of a kick back and having the wood thrown from the saw, two precautions are

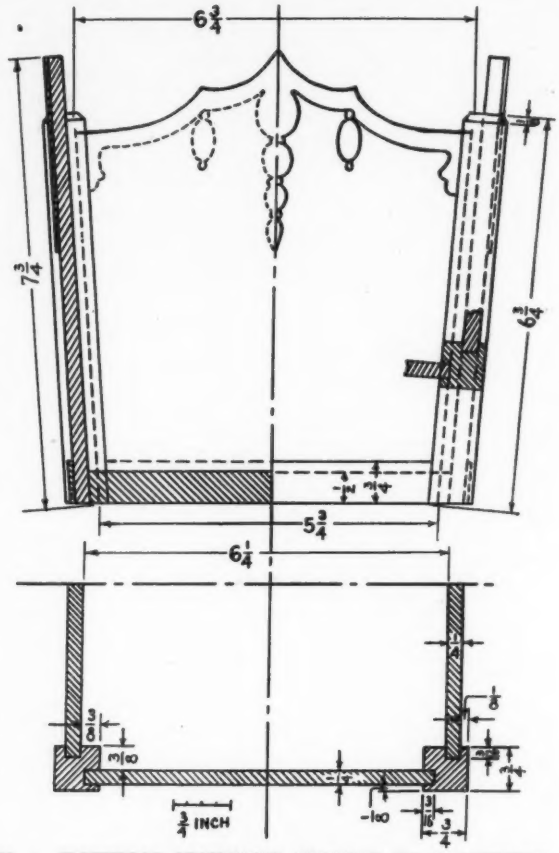


FIG. 1. FLOWERPOT RECEPTACLE, DESIGNED BY C. ANTHONY VAN KAMMEN.

taken. First, the marked post is laid in position over the saw and a stop block or board is clamped on the front of the machine against which the work is abutted when beginning the cut. In addition to the clamp at the front edge of the table, a hand screw clamped low on the front end of the fence will hold the stop piece more firmly to the table and prevent chattering. (See Fig. 2.) All pieces placed

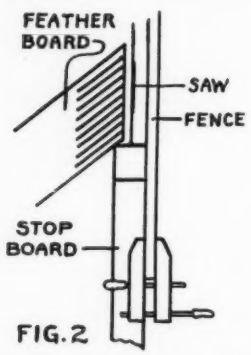


FIG. 2

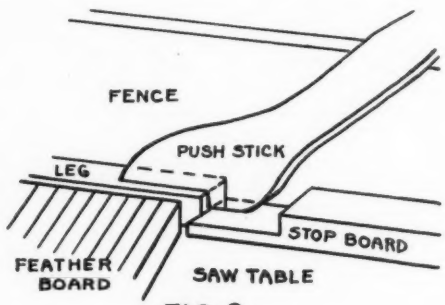


FIG. 3.

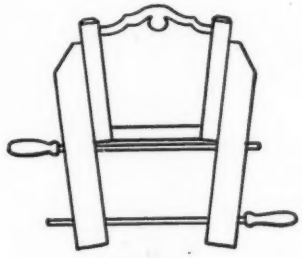
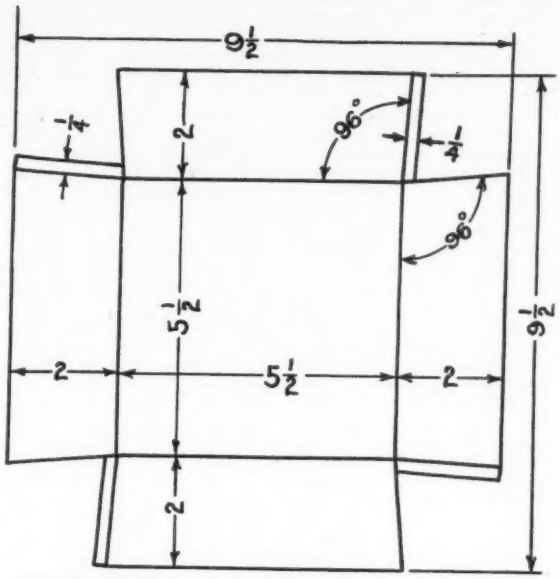


FIG. 4.

CUTTING THE GROOVES IN THE CORNER POSTS, AND CLAMPING THE POSTS TO THE SIDE PANELS. FLOWERPOT RECEPTACLE, C. ANTHONY VAN KAMMEN.



-SURFACE DEVELOPMENT-
TIN WATER CONTAINER
FIG. 5.

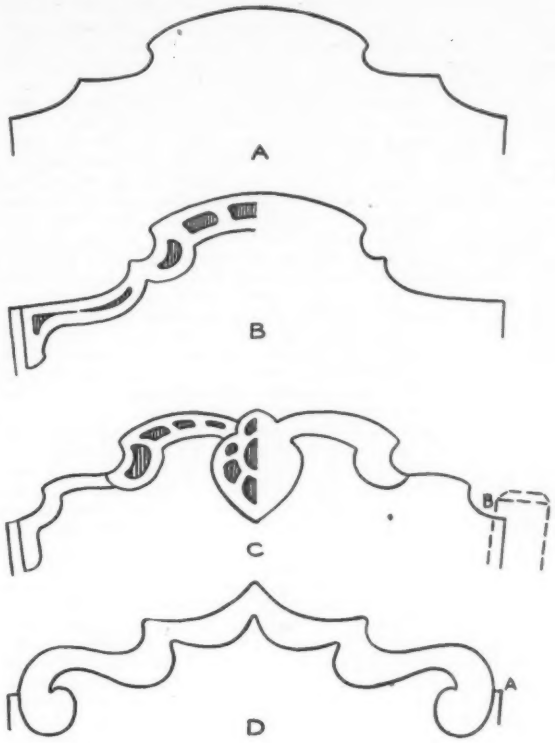


FIG. 6.

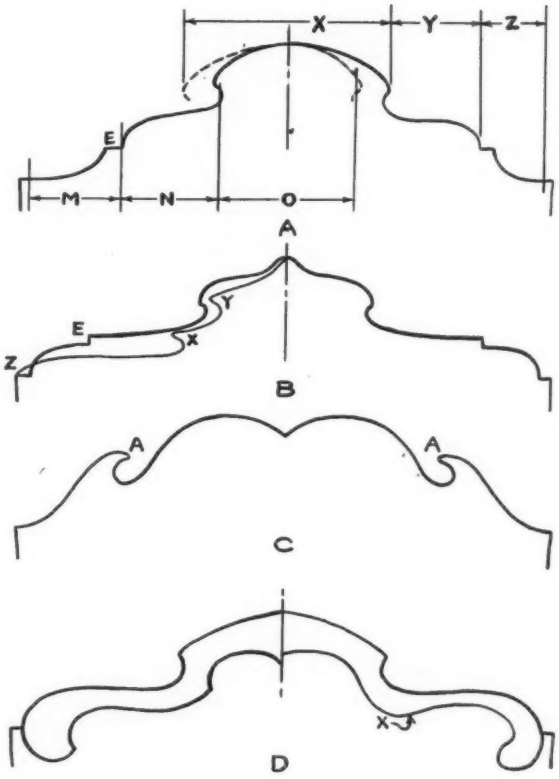


FIG. 7

USE WITH DESIGNS "D"
FIG. 6 AND 7, IN CENTER
OF PANEL.

FIG. 8.

FIG. 5. FLOWERPOT RECEPTACLE. FIGS. 6, 7, AND 8 CONTOUR AND SURFACE ENRICHMENT DESIGNS. C. ANTHONY VAN KAMMEN.

against the stop will have the same length groove. The end of the stop board near the saw should not be thicker than ⅜ in. so that the push stick used may catch the back end of the corner posts as they are guided over the saw. (See Fig. 3.)

As a second precaution, a feather board is forced lightly against the side of the corner post holding it firmly against the fence. The feather board permits the work to be moved over the saw away from the worker but will not permit it to be moved toward the worker but rather wedges it tighter and tighter against the fence as long as the piece is held down on the table. To make the grooves square at the upper end, it will be necessary to chisel them out. Avoid splitting out the tops. Chamfer the tops of the posts as shown in the drawing. Sandpaper all parts carefully and assemble. Use a 14-in. "Jorgensen" hand screw and clamp two side panels with their posts in one hand screw. This is easily done by running a little glue in the proper grooves, slipping the posts one on each side of the panels and laying them one upon the other. Slide the hand screw up from the bottom end with the jaws open widest at the open end. (See Fig. 4.) When these are dry, complete the assembly of the other panels. Make sure that all panels seat properly in the grooves so that all sides will have the same shape. Also see that the base opening is square to receive the bottom. When dry, set the miter fence at the proper angle so that the base will run parallel with the saw. The angle between the base and the side is 96 deg. Tilt the saw table at an angle of 6 deg. If the shape of all the sides is the same, that is, if all the panels are fully seated in the grooves of the legs, no trouble will be had in cutting the ends of the panels so the base will set level.

Set the assembled part on the piece to be used for the bottom and trace all the way around the inside with a very sharp pencil. The lines that have just been drawn represent the shape of the under side of the bottom. If the work as glued up is square, these lines may be used to cut to, tilting the circular saw table at an angle of 6 deg. as before. Cut on the right side of the saw. The corners will have to be cut on the band saw, tilting the table to the right or left as needed. A better method for cutting the bottom is to draw accurately a full ⅛ in. outside the traced lines and let these lines represent the shape of the top side of the base. Draw a distinguishing mark on a panel and on the corresponding side of the base. With the table tilted as before cut on the left side of the saw. The corners are cut on the band saw as stated. Fit the bottom in place and fasten with brads. The work is now ready for the art department. Here the coloring will be done as specified in the color plate.

It is suggested that a tin or zinc dish be made to fit inside the receptacle to retain water that may leak from the plant pot. This is not a difficult problem if made with a square bottom equal to the size between the posts, and may be made in the woodshop if no metal shop is at hand. The pattern can be developed in one piece. The sides of the dish need not be higher than 2 in. (For layout of the water container see Fig. 5.)

Though the art department will design satisfactory contours and surface enrichments without aid, a few suggestions and examples, good and bad, follow, as a help to manual-training instructors who may care to make the entire problem in their shop. Squared paper, ¼ in., should be given to the boys upon which at least four contours should be drawn. Keep the contour curves for the top of the panel inside a ½ by 6¾-in. rectangle. A sample sheet as designed by members of the class is shown in Figure 6. Though three designs for the applied cardboard surface enrichment are done on the sheet, only one should be drawn by the student on his sheet, after the contour to be used is selected. This surface enrichment may be made very simple or it may be made elaborate. Figure 6D is of the simple type, while Figures 6B and 6C are pierced and carved. This work is done with sharp carving tools.

In conjunction with the simple designs as shown in D, Figures 6 and 7, a small unit similar to Figure 8, placed on the central axis of the panel and slightly above the center is advised. The best surface designs will be made by following rather closely the contour of the top edge. See that there is variety of measure both in the contour lines and in the space divisions of the surface designs. Curved lines should meet straight lines at right angles or as tangents to them. (See Fig. 6C, point B and 6D, point A.) Use only free-hand lines and avoid the true curve of the compass circle when using curved lines. Contrast may be obtained by complete change of direction of line or by the insertion of a fillet; a short straight line at right angles to the curved lines. The latter is shown in Figure 7A, point E, and Figure 7B, point E. Avoid combinations of lines forming points as at A, Figure 7C which are structurally weak. The point may easily become split or chipped off.

The measure is bad on the left side of Figure 7A. Measures M, N, and O are nearly equal. The right side shows an improvement. The measures X, Y, and Z are decidedly unequal. The design drawn in light lines Figure 7B is similar to Figure 7C at point A, in that both the points X and Y are structurally weak. The curved line, point Z, meets a straight line at other than a right angle or a tangent. The heavy lines correct the problem. Figure 7D, right, shows a contour line and surface design in which the line X is weak and monotonous, having no point of contrast. See improved lines on left half. For a better comparison use a mirror that can be placed with an edge on the center line while held perpendicular to the paper.

FARM MECHANICS

Harness Work

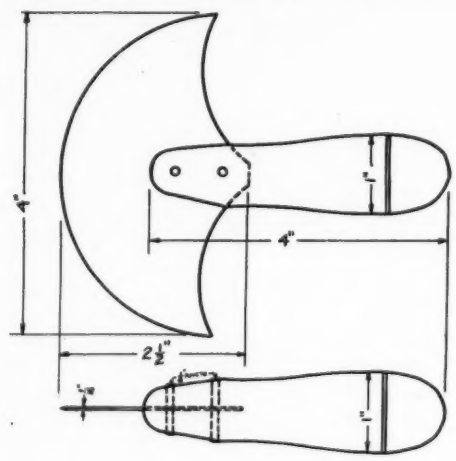
Fred Short, Barron, Wis.

Even with the advent of power machinery of all types for use on the farm there is still a big field of activity for the horse. This makes it desirable that in a farm-mechanics course there should be included some work on the harness and its care and repair.

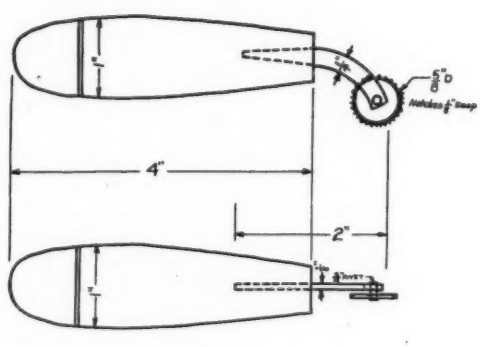
Much delay and expense can be avoided if a repair can be made on the harness when it is needed. Breaks usually occur when delays would be serious. Harnesses should be gone over thoroughly at regular intervals and all minor repairs made at the time. This will greatly minimize the likelihood of serious breaks when the harness is in use. At least once a year the harnesses should be cleaned and oiled.

In a course in harness work the major part of the time should be spent on different types of repairs. Pupils should be able to bring in from their farm homes parts to be repaired.

The equipment necessary for handling this work can be obtained at very small cost and much of it can be made by the pupils themselves and later taken home and used there to good advantage. The accompanying drawings show some of the equipment which can be made in this way and which is very essential in harness work.

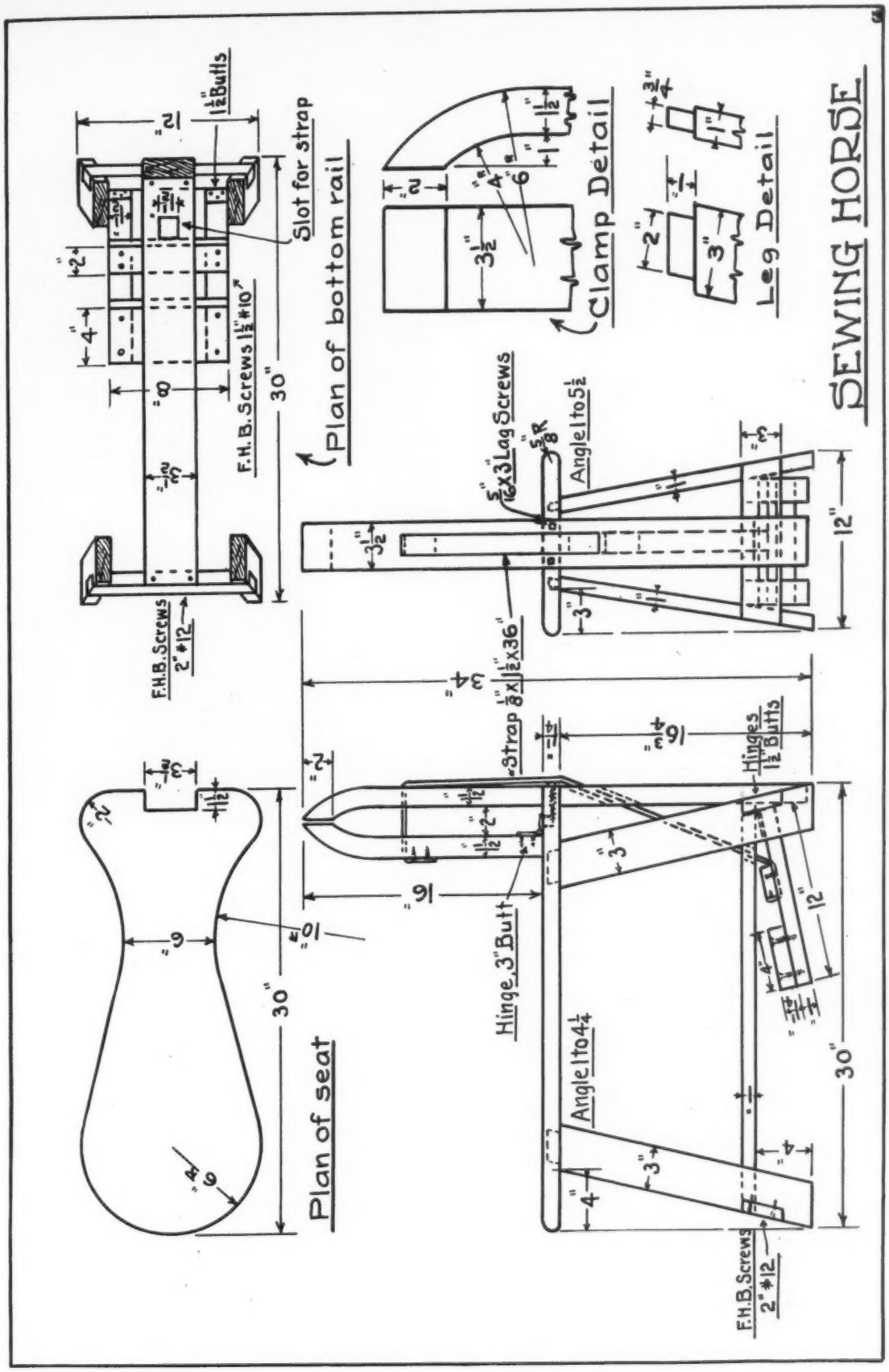


Round Knife



Pricking Wheel

HARNESS TOOLS, DESIGNED BY FRED SHORT, BARRON, WIS.



A SEWING HORSE, DESIGNED BY FRED SHORT, BARRON, WIS.

The Pricking Wheel

The pricking wheel is a simple device which is used in harness work for making an impression for sewing especially on tugs and other heavy straps. The wheel can be made by filing notches ⅛ in. deep and ⅛ in. apart on the outside of a ⅞-in. washer. This is riveted to the curved iron shank which can be made of a small piece of strap iron one eighth of an inch thick. It should be riveted so that it will turn freely but not wabble. The other end of the shank is pointed and driven into the handle. In this case as well as with the round knife an old file or chisel handle may be utilized for the handle. It is not necessary to use tool steel for the shank or wheel. Mild steel or strap iron is very satisfactory and more easily worked.

Sewing Horse

This horse can be made of softwood but hardwood is better. The clamps should be made of hardwood in either case. The edge of the seat should be chamfered as shown and the seat may also be padded if desired. The inside clamp is hinged and the outside one screwed to the seat with two ⅜ by 3-in. lag screws. The draw strap should be run through the clamps and down to the hinged pedal. This makes its operation quick and easy.

Bill of Material

1 pc.	1¼x12	x30	Top
4 pc.	1 x 3	x20	Legs
1 pc.	1½x 3	x34	Clamp
1 pc.	1½x 3	x16	Clamp
1 pc.	1 x 4	x 8	Pedal
1 pc.	1 x 4	x 8	Pedal Brace
2 pc.	1 x 1½	x18	Pedal Sides
2 pc.	1 x 3	x12	Lower End Rails
1 pc.	1 x 3½	x30	Stretcher
1 pc.	⅛x 1½	x36	Strap
1 pr.	Steel Butt Hinges, 3 in. wide		
1 pr.	Steel Butt Hinges, 1½ in. wide.		
2	⅜x3	Lag Screws	
12	2-in. No. 12 F. H. B. Screws		
8	1½-in. No. 10 F. H. B. Screws		

The Round Knife

The round knife is a tool which is used a great deal in harness work for end cutting and trimming. It can be made of an old saw blade or thin piece of tool steel. The edge should be ground on both sides. The handle can be made from an old file or chisel handle. It should be riveted to the blade as shown.

"I HAD PLENTY OF OIL BUT THE BEARING BURNED OUT"

Ray F. Kuns, Cincinnati, Ohio

Your story may be quite true. The thing to do is to look for the point in the lubricating system where the oil flow had been stopped, or some mechanical part has failed. In Figure 1, A represents a bearing which has given years of service and has come through without a scratch or other mark to mar it. At B, are shown two rod bearings from an engine which had the bearings burned out although there was plenty of good oil in the crankcase. At C, appear two halves of a center main bearing which were burned out because the oil feed line to them became stopped up with foreign material.

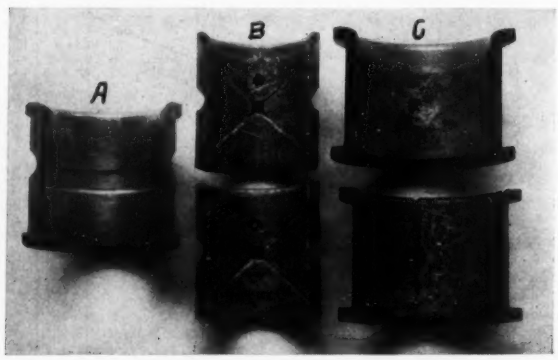


FIG. 1. *A* IS A GOOD BEARING; *B* SHOWS BURNED ROD BEARINGS; *C* SHOWS BURNED MAIN BEARINGS.

The answer to the last case is, of course, see that the oil lines are kept free of foreign material. This means that the system must have the oil screen maintained in order and the filth and sediment must be kept out of the crankcase, or it is bound to be picked up and circulated. The crankcase should be dropped at least once a season and thoroughly washed out.

Figure 2 shows an oil pump, which after 52,000 miles was so badly worn that it just ceased to function. The bearings of the car were taken up but the oil pump was not inspected. When the car was first driven the fact that the oil pump was not working was not noticed. Naturally the engine bearings burned out. When the pump was off for inspection the reason why it did not work became apparent at once. Notice how the teeth are worn. Compare the gear teeth at A, Figure 2, with those of the gears shown in Figure 3. A gear-

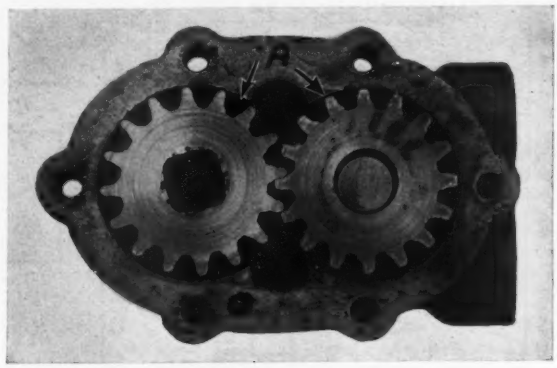


FIG. 2. THE CAUSE OF THE TROUBLE. A WORN OIL PUMP.

type oil pump draws in the oil at one side of the gears, say at point A Figure 3, and carries it around in the teeth and discharges it at the other side as at B. Now of course if the teeth are badly worn it will leak back past them where they run together at C, instead of flowing out and to the parts requiring lubrication.

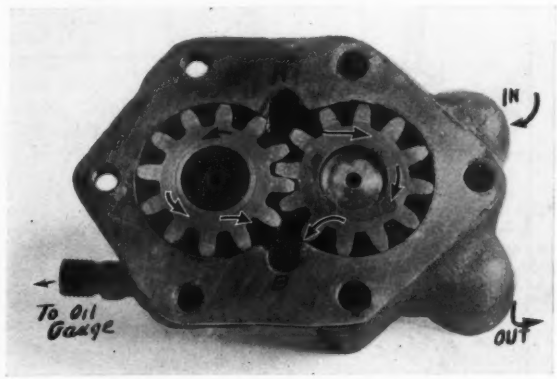


FIG. 3. AN OIL PUMP IN GOOD CONDITION.

Ford cars may burn out bearings due to stoppage of the oil line, because lint from the bands and even rivets from them will find their way into the tube and clog it up. Whenever trouble is experienced with any of the bearings in the engine, the oiling system should receive careful inspection, cleaning and, if necessary repairs.

BUILDING AN AUTOMOBILE BOBSLED

M. C. Koenders, Fond du Lac, Wis.

(*See Supplements Nos.* 81 *and* 82)

To anyone seeking something new in the way of thrills and winter sport, automobile bobsledding is sure to recommend itself. During the past few seasons more and more of these odd sleighing parties are to be seen. Given a car, any old kind will do, a bobsled of some sort, six or eight young people and a snow-covered stretch of highway, and anyone enjoying winter sports is sure to have something new and exciting in the way of a thrilling ride.

Of course the safety part of this form of fun must not be forgotten. A spill at thirty miles per hour, or a collision with the tow car due to an unexpected stop, are not to be desired. With the idea of having safe fun uppermost, then the accompanying sled which provides safety at any speed and yet furnishes thrills enough for the most daring, was designed.

The sled was built by four seventh-grade boys, whose ages ranged between eleven and thirteen. Our workshop equipment consists of a two-vise workbench, and a somewhat limited tool chest. All work was done by hand, but the finished sled exceeded all expectations as regards strength, finish, and ease of handling.

A great deal of our lumber was obtained from automobile packing crates which we procured from a local garage. Most of the wood was pine and we selected the best pieces. The only items which we purchased, were two oak planks for the seat or frame, and the metal fastenings and the steel runner shoes. The steering wheel

and hand horn were furnished by the garage, while the short lengths of pipe used were obtained from a local creamery.

The four runners were made first. This provided a job for each boy. When the runners were done, two boys assembled the front runners while the other two assembled the rear pair. No nails were used; screws being used throughout for strength. We obtained some heavy steel from a wrecked windmill tower. This was bolted to the runners to prevent their breakage through slewing and to give rigidity to the whole sled.

Next we started the seat which is also the frame in this case. This was made of two pieces 1 by 12-in. oak, 8 ft. long. The two pieces were then fastened together by means of two oak crossbars at each end and three narrower crossbars spaced evenly between the ends. The curve at each end of the sled platform was drawn with a 12-in. radius. All the wooden parts were then assembled.

After finishing the woodwork, we took up the metal work. The first thing was the fitting of the runner shoes. The steel was cut to the proper length and then heated in the schoolhouse furnace. Then it was hammered to shape over the runner. It will be noted that the runner shoes are curved up at the rear. While this is more work, it protects the end of the runner and makes backing easier. The shoes were drilled for screws, the holes countersunk, and then fastened to the runner by means of wood screws.

The steering gear consists of a piece of ¾-in. pipe, one end of which is welded to a steering wheel and the other end to a heavy steel plate. It is sawed near the top and the pieces jointed by a common pipe union. This is done to permit the front runners to be easily detached. We have since installed a ball-bearing race between the runners and the frame for easier steering.

Chains fastened to the front ends of the rear runners, prevent any excessive vertical play.

Lastly, we made a towing bar, which we found much more desirable than a rope. A quick stop may thus be made by the tow car without danger of injuring the sled. This bar was made from a scrap piece of pipe to which a suitable fastening was attached. It is bolted to the rear of the car and attached to the sled frame by means of a U bolt. It is important that the sled be towed from the frame instead of the runners or else the steering mechanism will not work.

The sled was then finished with two coats of bright red enamel, striped with gold, and protected with a coat of spar varnish. All metal work was given two coats of aluminum paint. So far we have not seen a prettier bob on the road.

We have tried this sled at speeds of from 5 to 45 miles per hour, with from two to five passengers. Naturally, it rides much better with five than with two people. We have tried to tip the sled by running in icy ruts and by slewing, but so far have not succeeded in overturning it. I do not mean to say that it cannot be tipped, but I do say that it will not overturn if handled with just a little common sense and care on the part of the driver.

Details of Construction

Total length, 9 ft.; total width, 30 in.; length of seat, 8 ft.; length of runners, 3 ft.

The front runners are braced at the front end by a ½-in. through bolt with a ¾-in. pipe spacer between.

The runners also are braced with heavy angle steel to runner plank on outsides only. On the inside they are braced by blocks screwed to both runners and runner planks.

The steering pipe is welded to the wheel and to a heavy steel plate. It should be cut and threaded near the wheel, and the parts should be joined by pipe union. This is done to facilitate assembling and disassembling.

All bolts must have washers. All screws are countersunk.

Seat, or frame, must have a steel bearing plate on top and on the bottom of the bolster where the steering pipe passes through, or wear will develop. There must also be a steel bearing plate on the top of the front runner plank for the ball race to bear upon.

After building an auto bob from plan No. 1, one of the members of the class decided to build a sled practically the same as the original, the only difference being that the front runners are placed 18 in. from the front of the sled instead of 12 in. as we first planned. The plans for our first sled were then called No. 1, and those of the second were labeled No. 2. The reason for extending the seat of the sled farther out over the front runners is to provide greater clearance for the steering wheel and also to act as a snow shield and tool box. Either sled works very well, no difference being noted in steering or riding. A sled built from the first plan will carry five people more handily than a sled built from the second plan. As to runners, length, width, and constructional details there is no difference.

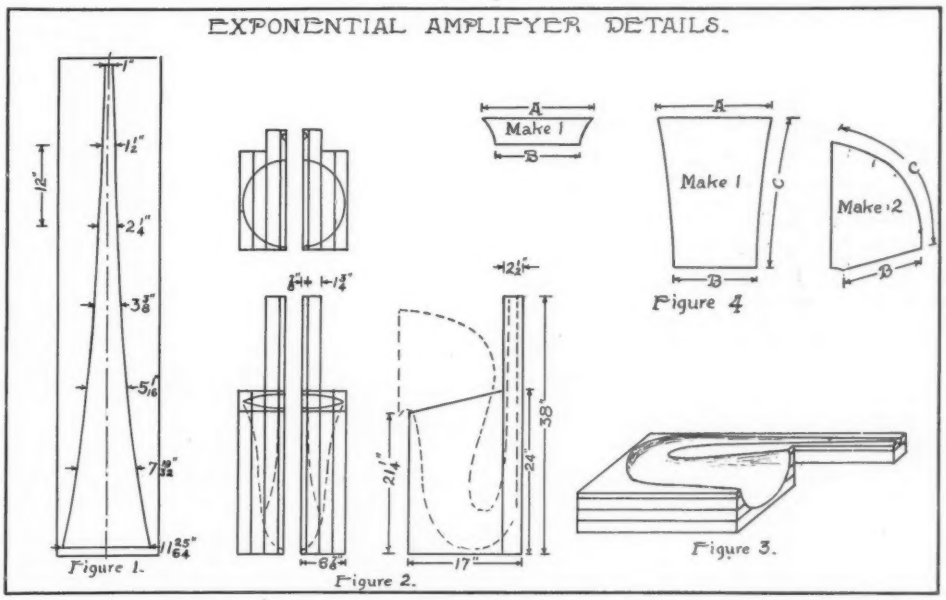
THE EXPONENTIAL AMPLIFIER FOR RADIO AND PHONOGRAPH AMPLIFICATION

E. M. Winterbourne, Denver, Colo.

One of the most interesting of developments in the radio and phonograph world of late has been the perfection of a horn or amplifier which will amplify the lower notes of the scale as much as the higher ones. The old type of phonograph or radio horn was capable of amplifying or reenforcing the higher tones, but the air column was not long enough to amplify the lower ones. Psychological studies, which have been made along this line, indicate that even though a person may not be conscious of it, it is very tiring to listen to music in which the lower tones are omitted.

In order to successfully amplify all the notes, with a horn type of amplifier, it is necessary to have a horn 72 in. or more in length. In order to accommodate this amplifier in the phonograph or radio cabinet, it would, of course, have to curve back on itself once or twice, and also, it would be necessary to design the cabinet so as to allow more room for the amplifier.

The investigators in this field have tried out a great number of shapes in the designing of amplifiers, but the most successful one, from theoretical and practical standpoints, is the one designed on what is called the exponential curve. This exponential curve or rate of increase is sometimes called the "law of organic growth." This is the rate at which plants and other organic materials increase in size. To illustrate: If a tree increases in size at the rate of 12 per



DETAILS OF EXPONENTIAL AMPLIFIER, DESIGNED BY E. M. WINTERBOURNE, DENVER, COLO.

cent every year, the amount added each year would not be 12 per cent of the original tree, but would be 12 per cent of the size of the tree the year before. In applying this rule to the horn, the horn must be designed so that for every unit of length added, the diameter of the opening will be increased a certain percentage, not of the original opening, but of the opening at the last measurement. If the original opening is one inch, and the size is to increase at the rate of 50 per cent, the opening at the end of the first foot would be one and one-half inches; at the end of the second foot of length, two and one-fourth inches, etc. This will result in a horn of the approximate shape of Figure 1. Of course, the unit of length taken might be any unit desired, as, for instance, six inches; but the percentage of increase per unit of length would necessarily be less. For practical purposes the unit of length taken as a foot will be satisfactory.

It has been found that there is a certain point called the "cut-off," and that the exponential horn will not amplify frequencies below this point. This cut-off point is dependent upon the rate of expansion; the greater the rate of expansion, the higher will be the cut-off point.

The rate of expansion of the amplifier shown in the drawings is 50 per cent, which gives very satisfactory results. If the length of this were increased, keeping, of course, the same rate of expansion, it would make it even better. After the tone has been amplified by passing through the entire length of the exponential amplifier, it is then released into an outer tone chamber, the size of which need not be computed, but simply made to correspond to the opening from the cabinet.

In planning any horn, it would be well to decide first on the length, and the diameter of the small opening. You may wish to experiment some with different lengths and different rates of increase. Take a piece of wrapping paper of the length of the desired horn, and draw a straight line down the center, with perpendicular lines at every foot of length. Now measure off the diameters on these perpendiculars as you figure them, one half the diameter on each side of the center line. These points are now to be connected with a curved line, as shown in the drawing. After the shape has been worked out, you must decide just where the horn is to double back on itself in order to go into the space provided for it. Now make a full-size paper pattern of the horn with its curvatures.

The horn itself may be made of a rather heavy gauge of sheet metal, and made square in cross section if desired, but may quite easily be made of wood and of circular cross section. Sugar pine is the best wood to use, as it works so easily. In making the horn shown in the drawing it would be well to glue up the two half sections of pieces seven-eighths and one and three-fourths inches in thickness. The surfaces must be perfectly planed and smooth; the glue hot, and of the proper consistency, and the hand screws must be fitted and all ready to apply. See that the jaws of the hand screws are parallel, so as to get an even pressure all over the surface. Use enough hand screws to get a perfect job, as carelessness here will cause failure. On wrapping paper, make a pattern of the shape of the amplifier as shown in the side view of Figure 2. Make careful measurements at each unit of length, not forgetting to count the length used in making the turn. It will be necessary to use free-hand curves in working this out. In making the turn, keep in mind the general shape laid out in the full-length pattern, Figure 1. This pattern is to be traced on the inside surface of the two glued-up sections, being sure that they correspond, or register.

The hollowing out of the horn (shown in perspective in Fig. 3), with several different sizes of sharp gouges, requires some patience, and calls for careful work, but it is a fascinating job, and will take only a few hours to complete. It will be well to provide yourself with several semicircular cardboard templates for testing at each unit of length. This will insure accuracy. Make the inside as smooth as possible with the gouges, and then finish with sandpaper.

The inside of the horn must be given a hard finish so as to prevent the absorption of tone, and this finish must be put on before the halves are glued together. Two coats of thin shellac and two coats of good varnish or lacquer should be used. After the finish is dry, glue the two halves together and clamp, watching to see that they register, as there is a big chance of their slipping when the clamps are put on.

The construction of the outer tone chamber, or the bell of the amplifier, does not require such careful figuring, as it serves only as a deflector to throw the tone out into the room. This chamber should be the same size as the larger opening at the place where it joins the horn, and should flare out so that it will be the same size as the opening of the cabinet. In several types of the newer phonographs this opening is quite large. The sketches shown in Figure 4 of the pieces for the bell are just of the approximate shape, as the cabinet in which the amplifier is used would govern shapes, sizes, etc. Use wood of ¼-in or ⅜-in. thickness for the side pieces, and a thinner wood which may be easily bent, for the other pieces. These thinner pieces must be fastened to the side pieces with glue, and nailed with cigar-box nails. The entire bell must then be fastened to the main section of the amplifier in the same way.

In working out the full-size paper patterns for the outer chamber of the amplifier, notice that: dimension A, is equal to the width of the opening of the cabinet; dimension B, is equal to the large opening of the amplifier.

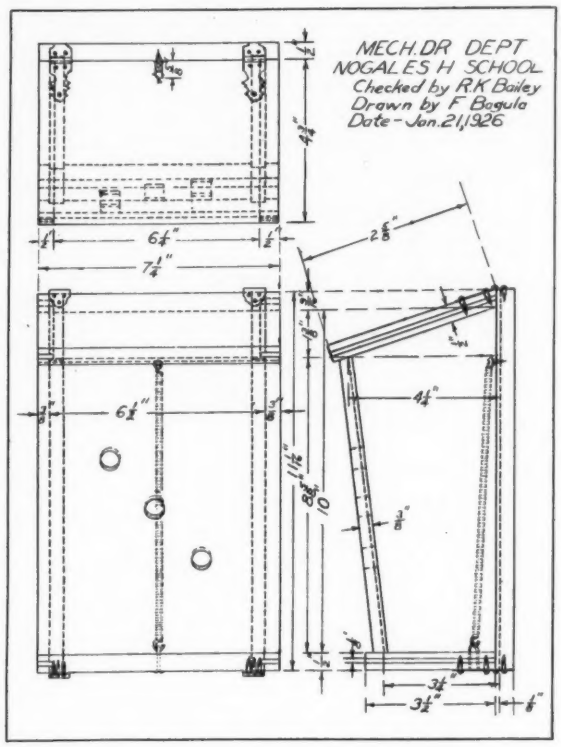
In mounting the amplifier in the cabinet, be sure that it does not touch the cabinet in any place without being insulated from it with several layers of felt. The small end of the amplifier should be tightly fastened to the underside of the assembly board, but should be insulated with felt washers.

MAIL BOX

R. K. Bailey, Nogales High School, Nogales, Ariz.

The mail box shown by the accompanying illustration was worked out in one of the beginning eighth-grade classes last fall. Because it is of a useful nature and novel in construction it proved quite popular with the boys.

Free mail delivery was established in this city a few months before school opened. As a result it was found that the majority in the class were interested in providing the home with a good mail box. A short course in the fundamentals of making and reading a working drawing was given the beginning eighth-grade students, in order to make their work more efficient throughout the year. At the close of this usual instruction period, the problem was taken up as a final one in drawing and design. The nature of the project makes it an excellent one in which to bring out and teach the principles of constructive design. Each boy in the class put in drawing form his idea of a model mail box and the good and bad points of each were discussed in class. The final analysis produced the article shown in the drawing.



MAIL BOX, SUBMITTED BY R. K. BAILEY, NOGALES, ARIZ.

The distinctive feature of the mail box is the hinged bottom door that is kept closed by use of a small spring. The spring, which may be obtained at the curtain-rod counter in any ten-cent store, is approximately $\frac{3}{16}$ in. in diameter. One spring can be cut to equip two or three boxes. The spring is secured with a small wire staple to the bottom cover. The staple is centered ⅞ in. from the back edge of the cover and the points clinched on the under side to prevent the staple from pulling out. The top end is fastened with a ½-in. No. 6 round-head blue screw, stretching the spring about ¾ in. to give the proper tension.

Some of the students carried the spring feature a little farther by using a spring of correct length to allow fastening to the top cover, close to its back edge with a staple as was done on the bottom cover. If the spring is attached in this manner the top cover will always be drawn down by the spring after it has been raised to deposit mail.

The end grain of the top and bottom covers is reinforced with a spline ⅛ by ½ in. to prevent checking and warping of these parts.

The front and back may be dadoed to receive the sides of the box as shown in the drawing or a plain butt joint may be used when presenting the project to lower-grade pupils.

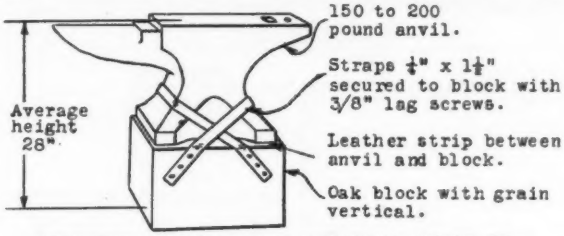
The holes in front of the box are for the purpose of determining if the box contains mail. The size and spacing of these holes offers an opportunity for individual variation in design.

The box may be painted to harmonize with the porch surroundings or it can be stained any color desired and then finished with a good grade of varnish.

MOUNTING THE SHOP ANVIL

C. C. Hermann, Moline, Ill.

The anvil base should be of oak, either a solid block or built up of oak planks with several through bolts to hold the planks securely together. The anvil is set on the end of the grain, that is, with the oak-block grain vertical. Between the anvil and the block is placed a pad of leather; a strip of double-ply leather belting will be satisfactory. The anvil is secured to the block by two steel straps ¼ in. thick and 1½ in. wide, bent around the foot of the


150 to 200 pound anvil.
Straps ¼" x 1½" secured to block with 3/8" lag screws.
Average height 28".
Leather strip between anvil and block.
Oak block with grain vertical.

MOUNTING AN ANVIL, C. C. HERMANN, MOLINE, ILL.

anvil as shown in the illustration. Lag screws ⅜ in. in diameter may be used to secure the ends of the straps to the block or in absence of these twenty-penny spikes will do.

The height of the anvil should be such that when standing beside it with the arm hanging straight down and the hand closed, the knuckles of the hand will just touch the face of the anvil. This height is best for comfortable working. An average height is 28 in. from the face of the anvil to the floor.

If the location of the anvil is permanent, the block should be of sufficient length to project into the floor about 6 in. The base should then be prepared by excavating 12 or 18 in., and tamping in solid with good cinders to bring the height to the desired point.

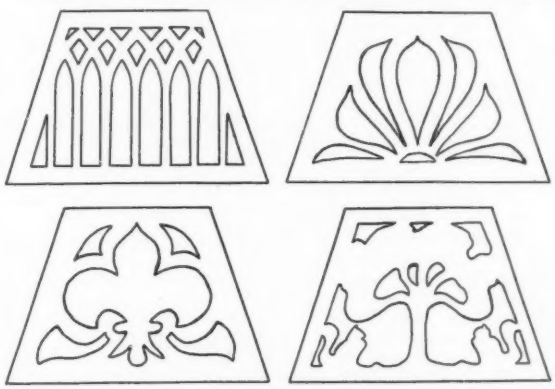
BOUDOIR LAMP

J. W. Bollinger, Theodore Roosevelt Jr. High School, Tulsa, Oklahoma

This boudoir lamp is not of the turned type, but is square throughout. It offers excellent opportunity for correlation with the art department in developing the designs for the pierced shade.

The post is mortised into the 3-in. base, and is reinforced with two screws. The 3-in. base is fastened to the large base with screws. To keep the lamp from being top-heavy, it is necessary to load the base with lead. The base is then covered with felt or heavy flannel.

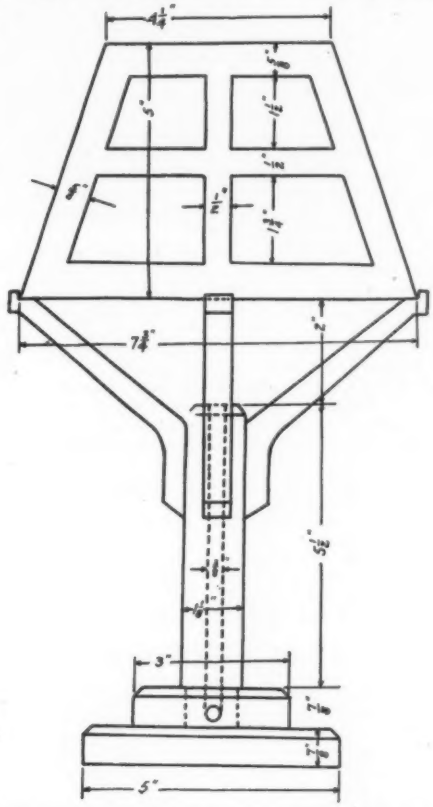
The four arms are made of ½-in. stock, and their design is



A CHOICE OF DESIGNS FOR BOUDOIR LAMP SHADES, J. W. BOLLINGER, TULSA, OKLA.

worked out to fit the lamp. They are held to the post by means of glue, a brad, and a round-head screw. After the arms are in place, and the shade is complete, the arms are notched at the top, to keep the shade from falling off.

The shade is made of ¼-in. hardwood, or of ¼-in. three-ply wood, and the pierced designs are cut out with a coping saw. Better still, the four parts of the shade can be cut out at one time on the jig saw. A special set of files, including a small assortment of jeweler's files, will aid in smoothing the cut surfaces where necessary. To put the shade together it will be necessary to cut the edges at a slight bevel. To determine this bevel, lay the four parts of the shade together, and set the T-bevel square on them. The parts of the shade are held together by means of glue and small nails. Sometimes it is ncessary to glue a small piece into the corners to reinforce them.



BOUDOIR LAMP, DESIGNED BY J. W. BOLLINGER, TULSA.

The designs for the shade are worked out with the art department. In making the designs, the larger the openings the more light will pass through, of course. If it is desired to throw the light downward, as for a study table, the pierced openings may be smaller. Caution must also be exercised to not make the wood parts too thin, so as to prevent breakage. The completed shade is covered on the inside with colored silk, to harmonize with the wood used in making the lamp.

A regular droplight fixture is attached to the post by screwing it on a short ¼-in. pipe nipple which has been driven into the post. Care must be taken that the candle power of the lamp used is not so strong that the heat produced will injure the finish on the shade.

TABLE AND MUSIC CABINET

John Y. Dunlop, Greenfield, Tollcross, Glasgow

This table and cabinet is a handy little piece of house furniture which can be made easily by senior boys in woodworking.

The music cabinet is made of sufficient size to hold three trays. The height of the table is 30 in.

The design of the turning on the table legs may be varied by making the turning with more breaks and moldings.

This design was chosen because of its simple lines and the ease with which the surface can be sandpapered and polished.

After the material had been planed down to the finished sizes, the table legs were laid out.

This entailed the cutting of the three mortises on each side until the adjacent mortises cut into each other.

Then the ball feet were built up. Since these feet are 1 in. larger in diameter than the legs, pieces ½ in. thick were glued on each side.

Two opposite sides were glued on to begin with. When the glue had dried, the surfaces for the adjacent pieces were jointed up, and the other two pieces were glued on.

Next came the laying out of the portions to be turned and the finishing of the legs in the lathe.

The rails were then laid out and the tenons shouldered and sawed down after which came the fitting of the mortise and tenons, preparatory to the gluing up.

However, before starting to glue up we had the top-rails cut for the pocket-screw nails which were to fix the table top.

These screw holes are 1 in. from each end, and the pockets are cut on the inside of the rail.

The four top-rails of the cabinet were also checked on the inside edge to receive the top of the cabinet as shown in the section CD.

The rails were now cleaned and sandpapered, after which the joints were glued and the frame cramped up.

To make up the panels of the cabinet the joints of the frame were mortised and the tenons cut, while the inner edges were grooved for the panel and the inner edge of the framing molded and mitered at the joints.

This entailed a great amount of hard labor and carefulness in laying out the length of the rail and making the proper allowance for the cutting-in of the molding at the mitered joints.

To insure a good finish at each of the joints, once the mortise-and-tenon joints were cut, the frame was fitted together and the face of the frame planed. Then the molding and grooving of the stiles and rails was proceeded with.

The panels which are ⅜ in. thick, were splayed on the back to fit a ⅛-in. groove on the framing.

Then came the gluing and cramping of the panels.

In fixing the bottom of the cabinet, it is cut to fit the inner corner of the legs and the edges are kept back from the face of the legs a distance equal to the thickness of the panel plus ⅛ in.

To the side panels are screwed the two fillets upon which the music trays slide. Only two of these are required on each side, as the third tray slides on the bottom of the cabinet.

The panels are now fitted in as shown in the illustrations and fixed with a few glued blocks.

Fit the top of the cabinet into the checked edges of the top-rails and give them a touch of glue to hold it down.

In preparing the top, the edge can either be molded or chamfered.

The top of the framing having been prepared, the top is clamped on and screwed from the underside.

The door is now to be hinged and fitted for the lock.

In making up the trays the sides are cut while the front and back are checked to receive the ends.

The bottoms, being of three-ply wood, are cut to size and glued and nailed in place.

Stain and finish the cabinet to match the surrounding furniture.

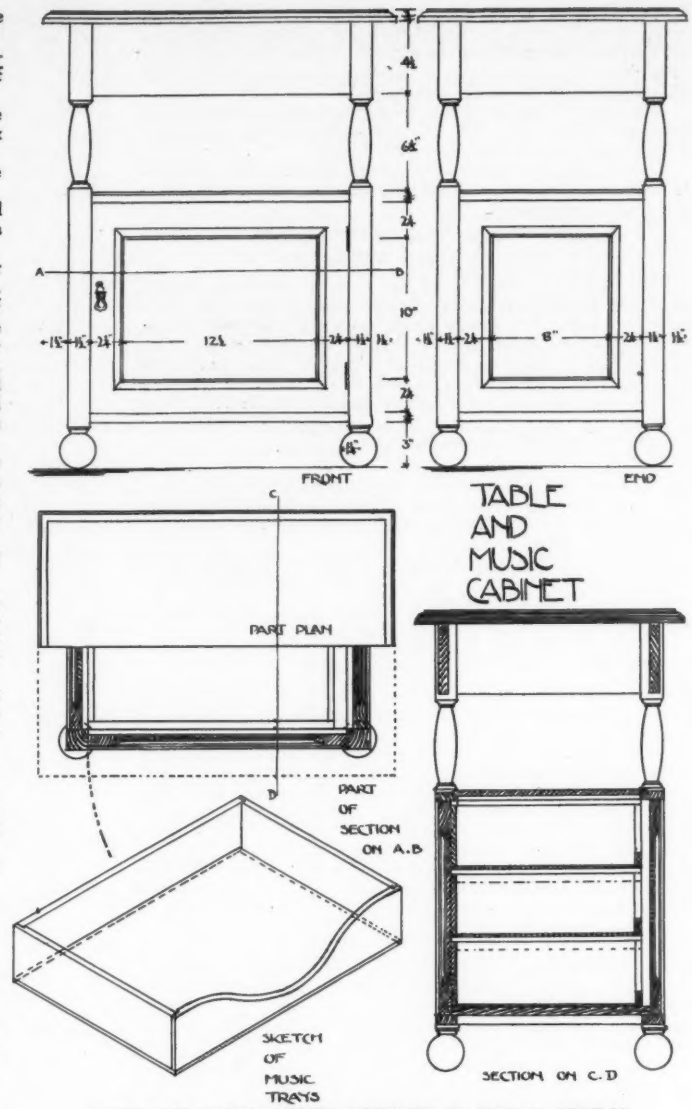


TABLE AND MUSIC CABINET, DESIGNED BY JOHN Y. DUNLOP, GREENFIELD, GLASGOW.

LAST-MINUTE CHRISTMAS SUGGESTIONS

MAKING SMALL BOXES

F. C. Hughes, Spokane, Washington

The box type of construction is common to a great many forms of handwork in wood and requires the stock to be both uniform in size and perfectly square on the ends.

These two requirements make a box of any kind, good educational material for elementary manual training, and boys as a rule enjoy boxmaking in any form.

The little box shown in the accompanying drawing is one that the author has found to be both satisfactory as a model and highly popular with the boys of the fifth or sixth grades.

The first step, of course, in the construction should be to prepare and assemble the sides and the ends, after which the bottom and top should be nailed on securely, and the whole box sandpapered until smooth and the corners rounded. This smoothing and shaping can be done much easier before the lid is ripped.

The ripping of the lid is perhaps the most difficult of the tool operations in this type of box, but the pupil who has had some ripping exercises preceding this project, can do it very satisfactorily.

After ripping the lid it should be sandpapered only enough to smooth off the roughness. It is very easy to sandpaper these edges too much on one or more of the sides and so make them fit badly.

The wooden lining should be fitted and secured in place with small brads. This lining is for the purpose of keeping the lid in place and also to increase the capacity of the box.

If a silk lining is desired, the accompanying sketch shows how this may be put in. The cards are cut to fit the top, bottom, sides, and ends, and the cotton and silk are used to cover these, much in the same way that upholstering is done.

Any one of several finishes may be used on this project with good results, but the one which gives perhaps the best and easiest finish is to use some of the new lacquers. Among these is the newest and most popular one which gives a crackled or parchment appearance to the surface.

When finished, this little box makes a most desirable gift as a candy box, trinket box, or glove box. The shape and style may be changed as conditions and uses warrant.

PLACE CARDS FOR CHRISTMAS

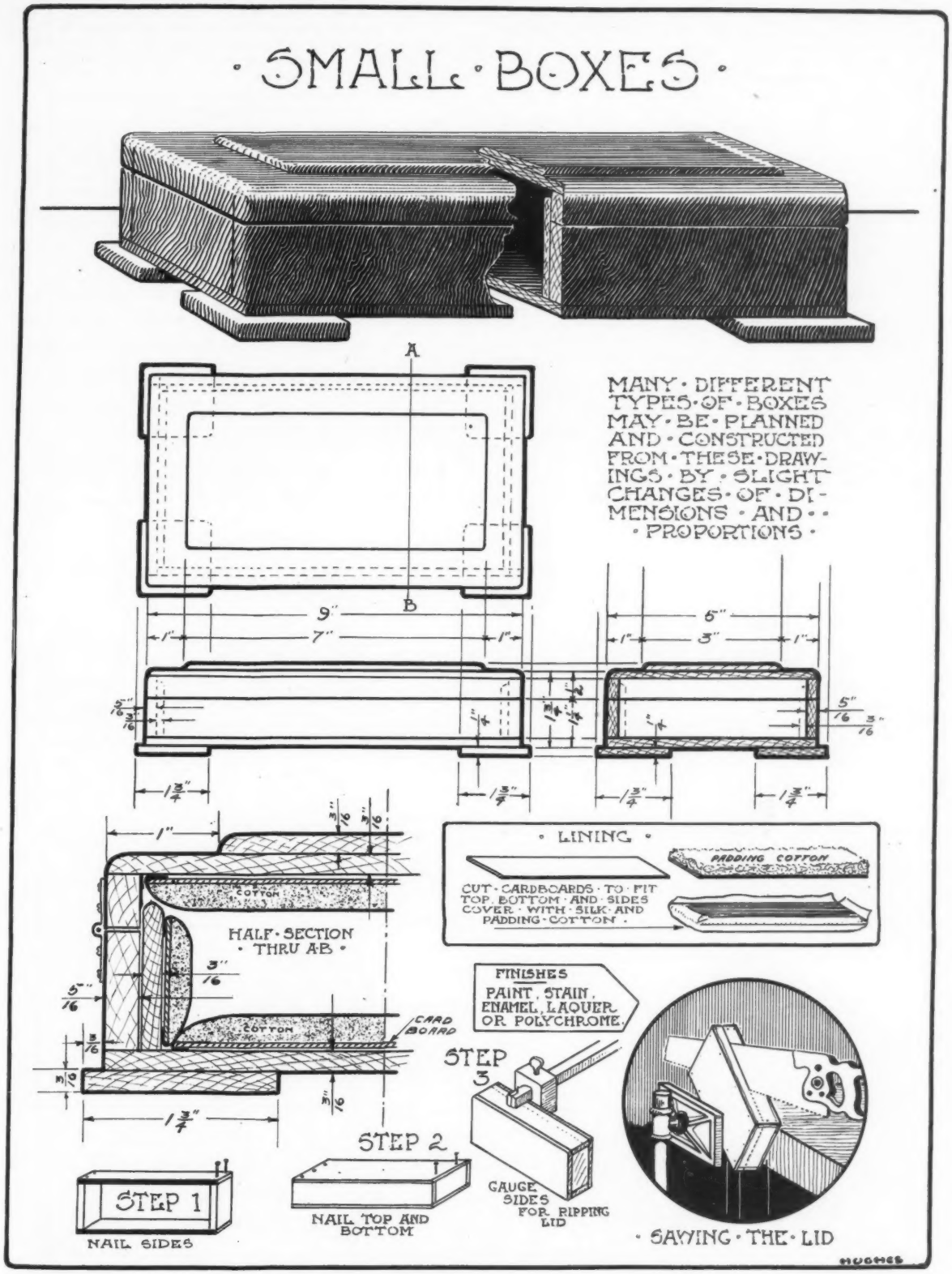
D. Elizabeth Roberts, Philadelphia, Pa.

Attractive place cards add greatly to the appearance of the table for a luncheon or party. The Christmas place cards here illustrated are easily made at school or at home by anyone who can handle pen and brush. Use cardboard which takes ink and water color readily. Trace the design on the cardboard and ink in the outline with India ink. Then tint with water colors.

Another method would be to have the students in the art class draw up the designs from which zinc cuts could be made. The school printshop can then produce them in quantity for hand coloring in the art department.

The outline around the edge of the card may be in gold, color, or ink. Cut out with scissors or a sharp knife and bend back on the dotted line. Each card is 3¾ in. long and 1⅛ in. for the least width.

For card No. 1, the flame should be yellow, with the circular space around it in orange or gold. The candlestick is pretty in a


· SMALL · BOXES ·
MANY · DIFFERENT TYPES · OF · BOXES MAY · BE · PLANNED AND · CONSTRUCTED FROM · THESE · DRAWINGS · BY · SLIGHT CHANGES · OF · DIMENSIONS · AND · · · PROPORTIONS ·
A
B
9"
7"
1"
5"
3"
· LINING ·
PADDING COTTON
CUT · CARDBOARDS · TO · FIT TOP · BOTTOM · AND · SIDES COVER · WITH · SILK · AND PADDING · COTTON ·
HALF · SECTION · THRU A·B ·
COTTON
CARD BOARD
FINISHES
PAINT, STAIN, ENAMEL, LAQUER OR POLYCHROME
STEP 1
NAIL SIDES
STEP 2
NAIL TOP AND BOTTOM
STEP 3
GAUGE SIDES FOR RIPPING LID
· SAWING · THE · LID
HUGHES

MAKING SMALL BOXES, F. CLARKE HUGHES, SPOKANE, WASH.

reddish-brown color, with a red candle to harmonize with the red and green of the holly.

Card No. 2 has red candles on the tree and ornaments in gold. The flower box is pretty in a metallic color, which may be made by mixing gold with any color.

For card No. 3, the basket is yellow and the ribbon red to match the red of the poinsettias and holly.

The ribbon on card No. 4 is red and the bell in the holly wreath a metallic color.

The tree on card No. 5 should be tinted green with patches of white left for snow, and the moon gold. A tint of blue or yellow is shaded out at the horizon, leaving the upper part white for the name space.

The colonial door on card No. 6 is tinted light yellow with a deeper color for the panels, and the upper part in delicate tones of rose and blue. The bell is gold between the red and green of the holly.

The vase on card No. 7 is yellow with decoration in color, the poinsettias red with two shades of green for the leaves, and the berries red.

For card No. 8 the clouds are slightly tinted at the edge, the sky is blue, the house two shades of a reddish color, the trees green with patches of white, and yellow or orange lights in the windows.

These Christmas designs may also be used effectively on greeting cards and calendars, either as cut-out designs or placed suitably on a white or tinted card.

HOW TO INSURE CORRECT WORKING DRAWINGS IN THE CABINETMAKING SHOP

L. N. Cilley, State Normal School, Gorham, Maine

Instructors in cabinetwork know how hard it is to obtain from their students, working drawings which are complete as to details, dimensions, notes, and correct stock lists. To obtain drawings even approximately correct, requires numerous time-wasting examinations and frequent checking.

Because of lack of time, many instructors will pass drawings which are faulty and which therefore cause delays during the construction of the article.

With the above in mind, the following list was prepared so that each student can check his own drawing, or drawings made by others. The use of this list acquaints the student with trade terms, and insures uniformity of requirements.

Necessary Items on a Working Drawing for the Cabinetmaking Shop

The drawing should have as many views as necessary to be clearly understood. It should be drawn to as large a scale as the paper will permit. *Sections and enlarged details* should be used when necessary to make intricate construction clear. A *bill of material* or *stock list* is very necessary. On it should be listed every part by its name or number, the number wanted of each, and dimensions should always be given in the following order: thickness, width, and length.

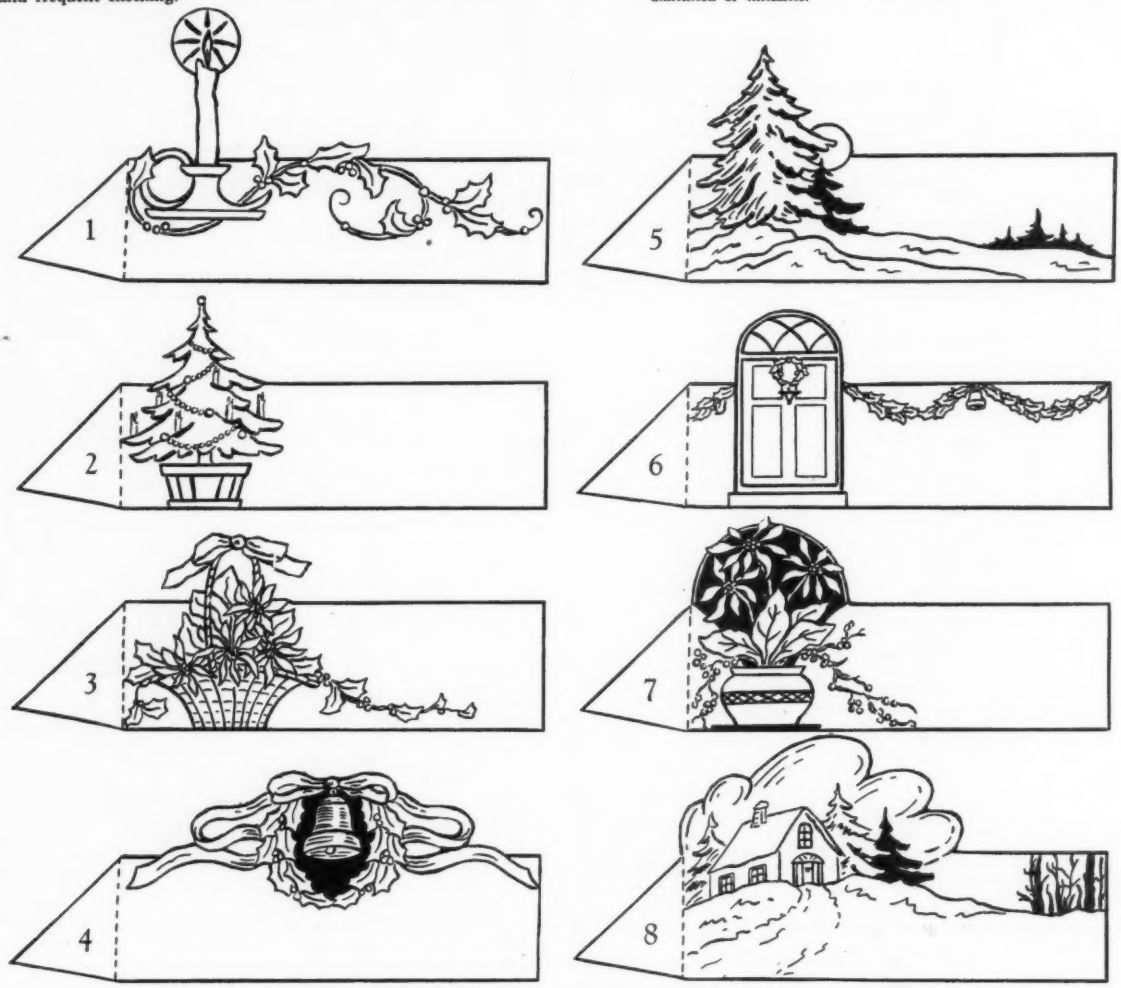
Items to Be Shown on the Drawing

Tops:
- Three dimensions. Also dimensions of overhang.

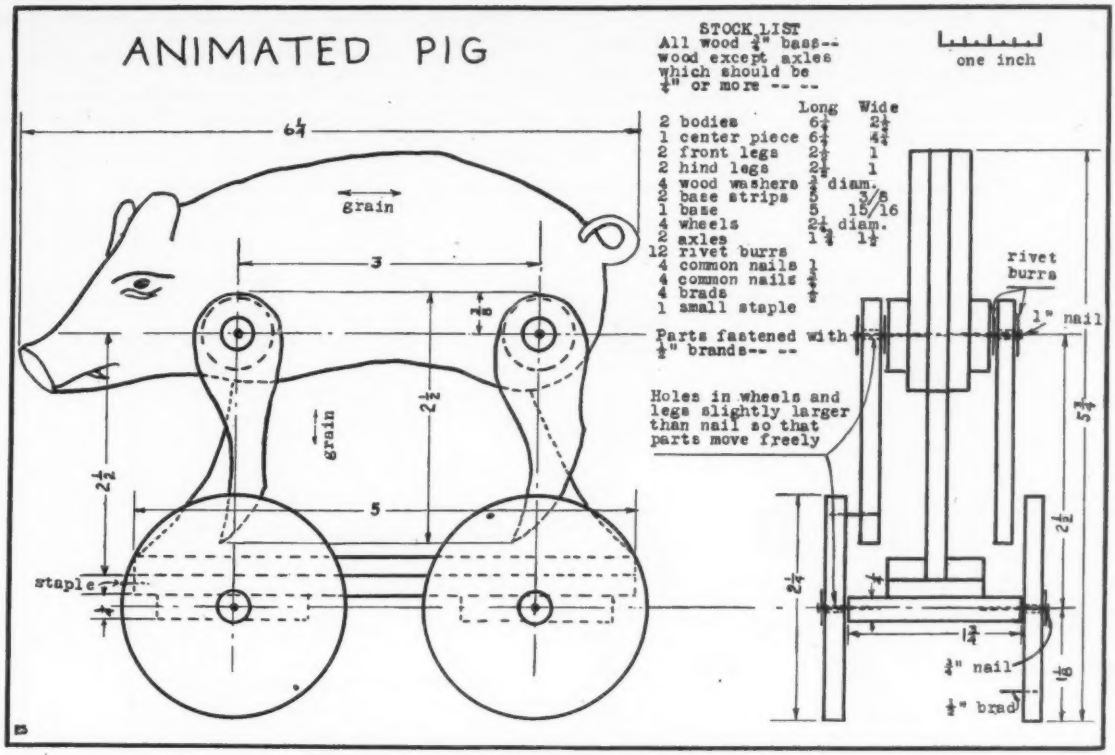
Legs:
- Three dimensions. (If legs are tapered, additional dimensions are necessary.)

Rails:
- End view showing width and thickness in hidden lines of one of similar pieces.
- Dimensions from the outside of this rail to the outside edge of the leg.
- Dimensions of the thickness of this rail.
- Dimensions of the width of this rail.
- Dimensions between the shoulders of the tenons or the distance between the legs in both front and end views.
- Hidden view of at least one of similar tenons showing its length and width along with a printed note stating its three dimensions.
- Dimensions of placement from top to bottom.
- Dimensions of the space between two rails.

Slats:
- Dimensions of the width of each slat, space between, and of any design.
- Dimensions between the rails with the dimensions of the length of the tenon.
- Dimensions of the overall length including both tenons.
- Edge view shown in hidden lines to show placement along with the dimension of thickness.



PLACE CARDS FOR CHRISTMAS, DESIGNED BY D. ELIZABETH ROBERTS, PHILADELPHIA, PA.


ANIMATED PIG
STOCK LIST
All wood ¾" bass-- wood except axles which should be ¼" or more -- --
one inch
Long Wide
2 bodies 6¾ 2¾
1 center piece 6¾ 4¾
2 front legs 2½ 1
2 hind legs 2½ 1
4 wood washers ¾ diam.
2 base strips 5 ⅜
1 base 5 15/16
4 wheels 2¼ diam.
2 axles 1¾ 1¼
12 rivet burrs
4 common nails 1
4 common nails ¾
4 brads ½
1 small staple
Parts fastened with ¼" brands-- --
Holes in wheels and legs slightly larger than nail so that parts move freely
rivet burrs
1" nail
¾" nail
½" brad
grain
staple

ANIMATED TOY, DESIGNED BY EDW. STANEK, CHICAGO, ILL.

Panels:
Dimensions of the depth of the groove allowing some clearance.
A printed note on its broad surface as to its three dimensions.
A similar note may be used for glass sizes.

Shelves:
End view showing hidden full-size lines with the dimension of width.
Visible tenon lines if of that construction, and invisible lines if not of that type along with its dimensions of width and thickness.
Edge view showing thickness with its dimension and hidden tenon lines.
Dimension between shoulders of the tenons or the distance between the end rails along with the dimensions of the length of the tenon, or, a printed note stating the three dimensions of the tenon.
Plain shelves fastened by screws or nails, require merely the three dimensions.

Drawer Fronts:
Front view showing flange if any, with end view of the sides of the drawer shown in hidden lines.
Dimensions of the width and length of the front with the dimensions of the amount of flange, if any.
Side view of the drawer in hidden lines showing thickness of the flange, length of the sides, and placement of the back.

Circular Work:
All radii given with dimensions pointing toward the center of revolution.

Notes:
Care must be taken in the placing of arrowheads for accuracy in making a stock list and in laying out dimensions.
Whenever possible always place the dimensions between the views and place all others in the best position to read accurately and quickly.
Whenever possible complete notes in regard to hardware of any description should accompany the drawing to make it more complete.
A model made up by the instructor which will include the most of these above items, will be of great help in teaching the fundamentals of cabinet drawing and cabinet construction.

ANIMATED PIG

Edw. Stanek, Chicago, Ill.

Although at first glance the animated pig appears to be a complicated project, surprisingly little care or accuracy is required in designing or making this toy.

First consider the axle, probably the most important part of the toy. The edges close to the wheels should be as square as possible, of course, but the wheels will function properly even if extremely wobbly. A piece of $\frac{5}{16}$-in. basswood has been used successfully as an axle. Two pieces may be nailed together, though no doubt, a solid piece of wood about $\frac{3}{8}$-in. thickness is best. Good results are obtained, and good workmanship is encouraged, if only axles that stand on edge are accepted.

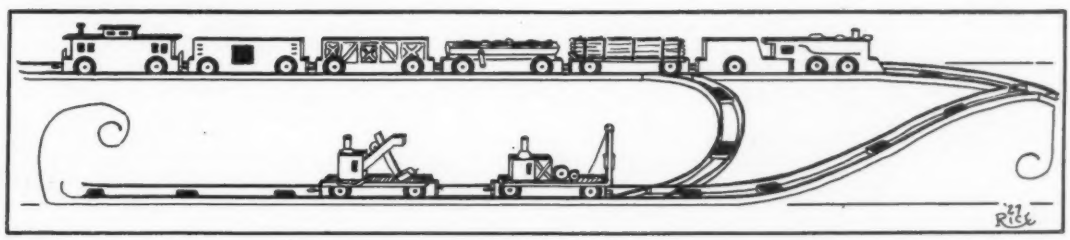
Some care should be taken to see that the nails of the legs and wheels are driven in straight although a mistake may be easily remedied by trying again or pulling out the part until it moves readily. More or less rivet burrs than shown may be used successfully.

The brads at the inside of the wheels must be set close enough to the edge to prevent striking the axle. The axle may be made narrower and the wheels smaller if desired.

The base should be narrow enough so that the brad on the wheel will not strike it.

The legs should be long enough to be hit by the brads yet not so long as to strike the base. No care is necessary in sawing out the wood washers or the outline of the animal as far as the working of the toy is concerned.

There may be a little trouble in putting the body together. Cut out the bodies, then fasten one the correct distance from a straight end of the stock for the centerpiece, then saw around the outline of the pig, leaving enough to support it, then nail on the other body. In case there is some mistake the legs may always be raised or lowered to fit right.

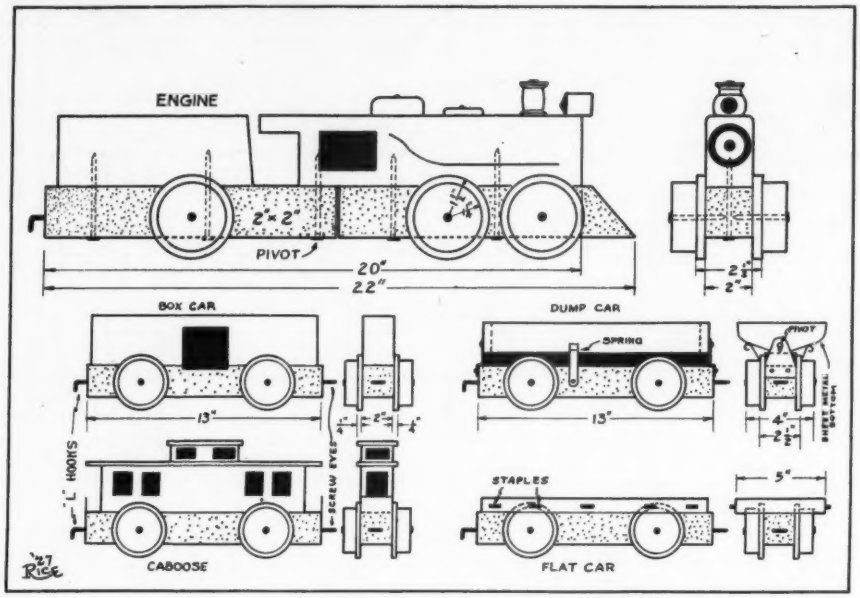


TOY RAILWAY SYSTEM, DESIGNED BY CHARLES M. RICE, EVERETT, WASH.

A TOY RAILWAY SYSTEM

Charles M. Rice, North Junior High School, Everett, Wash.

Somewhere, there may be a boy who has never found interest in a railroad train, but we have never met him. There are many boys, however, who are not indifferent to the pleasure of making toy trains for the back-yard-railway system and have constructed the trains from short pieces of stock, with tracks made from mill edgings. A large wooden train is more useful for outdoor play than the indoor models found in the toy market.



DETAILS OF TOY RAILWAY SYSTEM, DESIGNED BY CHARLES M. RICE, EVERETT, WASH.

The drawing shows a woeden train that can be made from short pieces 2 by 2 in. and 2 by 4 in. with four sides surfaced. The lower part of each car as well as that of the engine is made from 2 by 2-in. stock. The upper structure of the car is fastened to the 2 by 2 in. with 10d common nails. One half of a tin can may be used for the upper part of the dump car or the tin may be shaped to wooden ends if provided. The engine has a pivot near the center of its base. The wheels are made with a flange for the wooden tracks and should be cut on a band saw. (See "Cutting Wheels for Toys," INDUSTRIAL-ARTS MAGAZINE for Dec., 1926.) The wheels are fastened to the 2 by 2 in. pieces with nails or round head screws.

Wire mesh is fastened across the opening in the center of door of lower guard to cover and guard set screws in hub of wheel.

The exhaust hood is located snug up under the table, its left side forming a part of the edge of the guard.

From the point where the saw goes through the table the upper part of the hood is required to slope down to the right, or to the left if the saw is left-handed, to permit the table to be tilted to its extreme angle. See detail of hood.

BAND SAW

Properly Guarded and Equipped with an Exhaust

John F. Grant, Inspector

Instructors of classes in woodwork will be interested in this article which was taken from the *"Industrial Hygiene Bulletin,"* published by the State Department of Labor, Albany, N. Y.

Accidents in the use of band saws are sometimes caused by the breaking of the saw blade while the operator is cutting.

A sudden break will release the grip the saw has on the wheels but owing to the high speed, required the broken blade will retain much of its momentum and fly around promiscuously before going "dead," often becoming entangled in the spokes of the wheels before they can be brought to a stop.

Experienced operators will detect a slight "jump" in the saw blade before a "break" and are able with quick action, to shut off the power and stop the machine before the "break" occurs. However, many breaks are instantaneous especially with narrow blades.

The illustration shows a type of band saw, found in jobbing and manufacturing shops, for intermittent use, the wheels of which are completely enclosed with boxed guards.

These guards are hinged and may be easily opened to adjust the saw, and latched when closed.

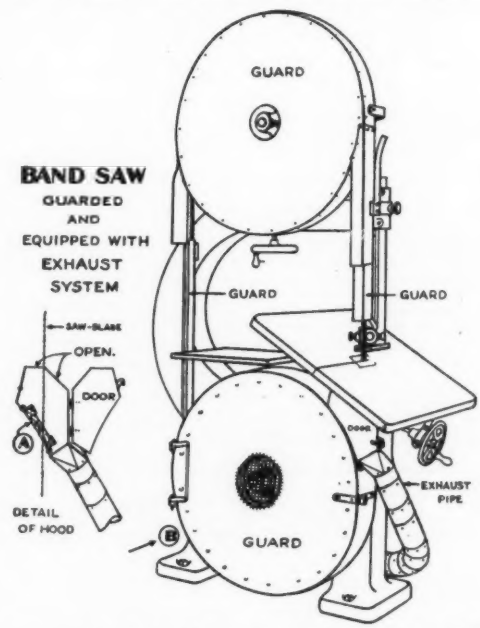
It will be observed that the saw blade is guarded between the wheels except at the cutting point between the guide and the table, which of course must be exposed to do the cutting.

A section of the guard over the saw blade near the cutting point is designed to raise and lower with the guide, insuring the maximum protection at all times.

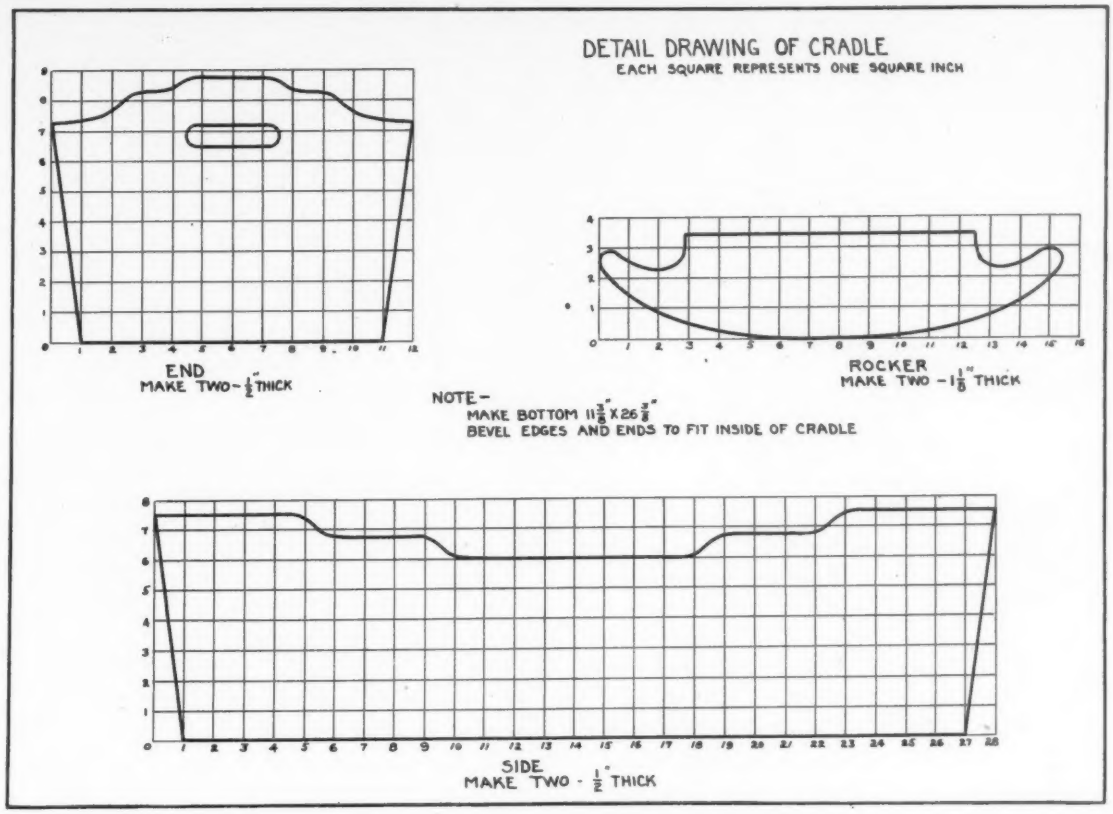
The up-run of the saw is carried through a slot in a beam which is fastened to the saw frame.

As shown in detail of hood a block of wood A, is required to be set into the hood and held in position by rabbets or bolts, through a cut in which the saw will travel. This will deflect the dust into the throat of the hood.

Branch pipe from hood should lead to the rear of the machine and up at a point to one side so that it will not interfere with its operation. This pipe should never be carried to the front of the saw as its position on the floor creates a hazard. Workmen stand on and crush it or slip on it.



Heavy-duty band saws used continuously are required to be equipped with two exhaust pipes, one as shown above and the other connected to the lower left-hand corner at B.


DETAIL DRAWING OF CRADLE
EACH SQUARE REPRESENTS ONE SQUARE INCH
END
MAKE TWO - ½" THICK
ROCKER
MAKE TWO - 1⅛" THICK
NOTE -
MAKE BOTTOM 11⅜" X 26⅜"
BEVEL EDGES AND ENDS TO FIT INSIDE OF CRADLE
SIDE
MAKE TWO - ½" THICK

DOLL CRADLE, DESIGNED BY F. W. DEJMEK, MARINETTE, WIS.

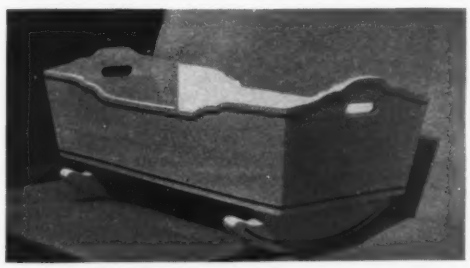
In this case the boxed guard would become a hood and would require a throat connection only at this point to connect with the pipe.

Prints of band-saw guards, exhaust hood and copies of the *Industrial Hygiene Bulletin* may be had at the office of the Bureau of Industrial Hygiene, Department of Labor, 124 East 28th Street, New York City.

DOLL CRADLE

Frank W. Dejmek, Marinette Vocational School, Marinette, Wisconsin

The cradle shown in the drawing is suitable for dolls that are from 20 to 24 in. long. In case a smaller cradle is desired, the squares should be made smaller accordingly. For instance, if a crad.e 21 in. long is to be made, make the squares only ¾ in. on a side. By reducing the size of the squares the proportions of the cradle remain the same.



DOLL CRADLE, DESIGNED BY F. W. DEJMEK.

If more than one cradle of the same size is to be made much time can be saved by making paper patterns of the side, end and rocker. Patterns made of heavy paper can be used many times and then put away for future use.

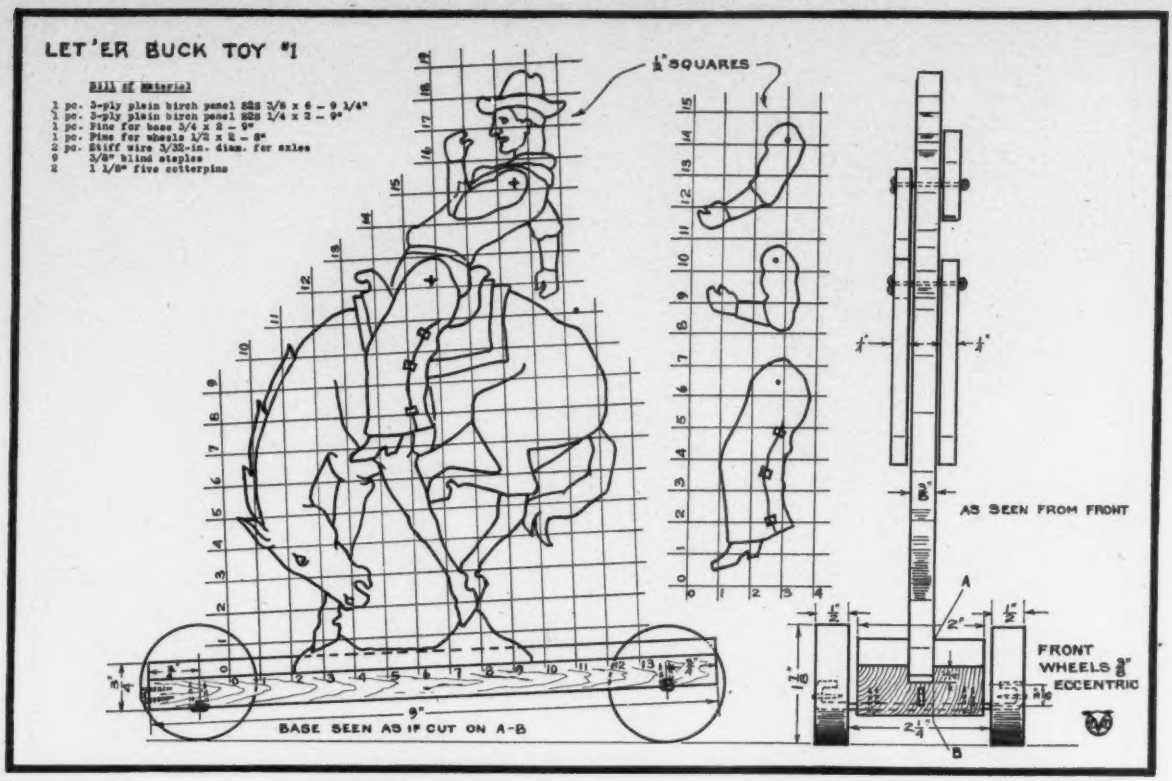
The cradle can be made very attractive and beautiful by painting it and applying a simple design. It also may be lined with some pretty cloth.

Artwork of the Juvenile Art Class of Vienna. The Austrian Junior Red Cross, which is in close touch with the Juvenile Art Class of Prof. Cizek in that country, has recently taken steps to bring the work of the children to the attention of American educational authorities and institutions. The organization has issued two sets of postcards from original drawings by the Cizek children. There are ten cards illustrating typical juvenile life and activities and ten representing different aspects of Christmas ideas. The cards are 5¾ by 3¾ in. in size, are carried out in color, and represent the work of children of 12 to 14 years of age.

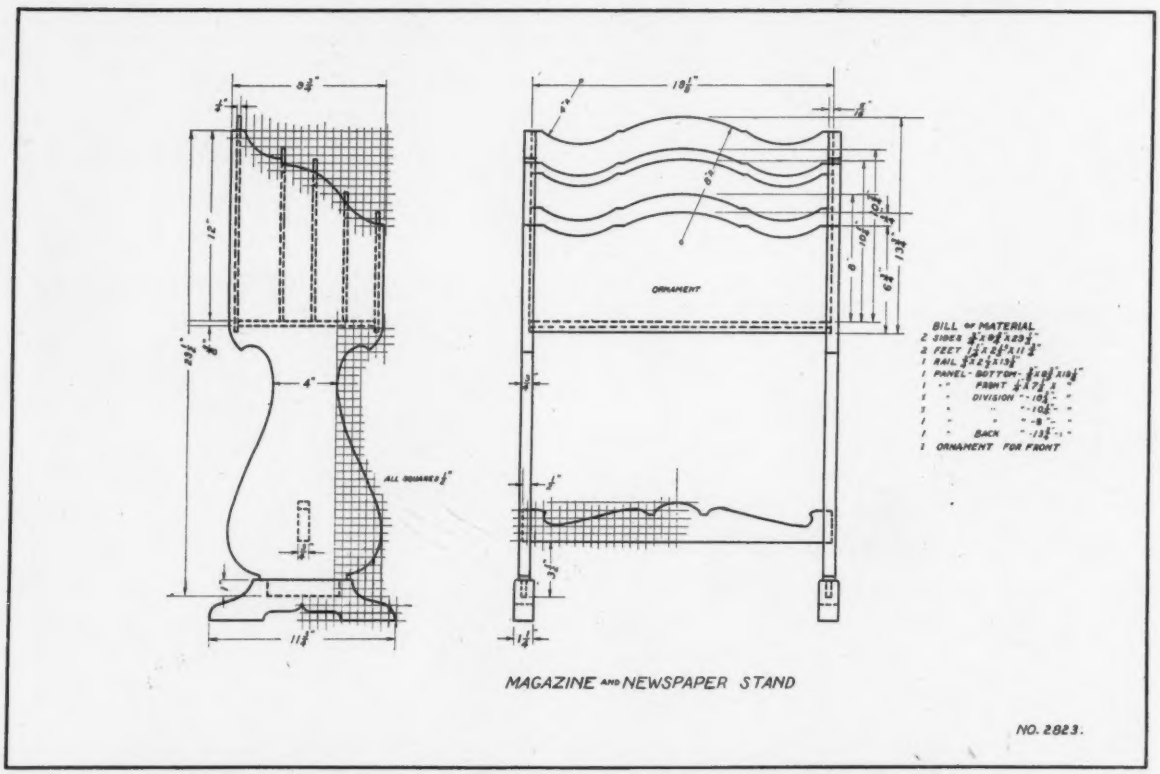
The cards may be purchased in sets of ten, at 27 cents, postage included. They may be obtained at the price of 22 cents if purchased in lots of 500.

School authorities and others interested in work of this kind may obtain copies of these cards by addressing the Austrian Junior Red Cross, care of Dr. Wilhelm Viola, Vienna I, Stubenring 1.

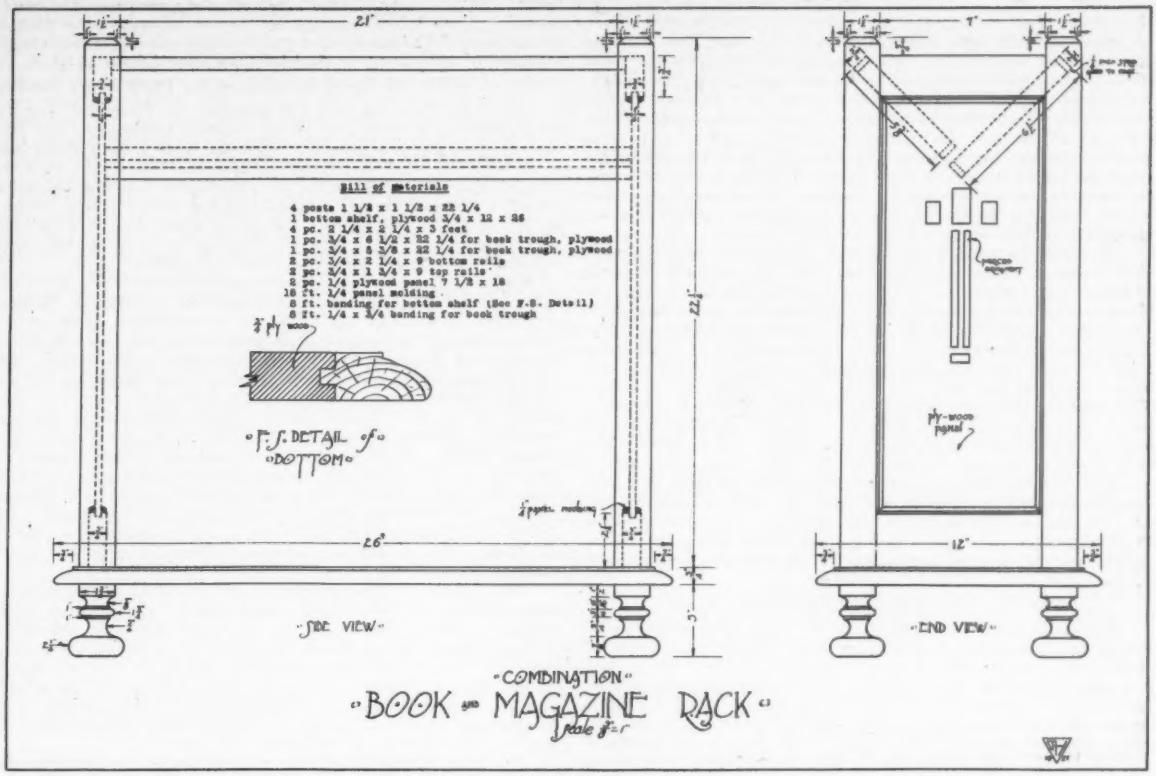
CARD, DESIGNED BY ONE OF PROF. CIZEK'S PUPILS.


LET'ER BUCK TOY #1
Bill of Material
1 pc. 3-ply plain birch panel SGS 3/8 x 6 – 9 1/4"
1 pc. 3-ply plain birch panel SGS 1/4 x 2 – 9"
1 pc. Pine for base 3/4 x 2 – 9"
1 pc. Pine for wheels 1/8 x 2 – 8"
2 pc. Stiff wire 3/32-in. diam. for axles
8 3/8" blind staples
2 1 1/8" five cotterpins
1" SQUARES
AS SEEN FROM FRONT
FRONT WHEELS ECCENTRIC
BASE SEEN AS IF CUT ON A-B
9"
A
B

REPRESENTATIVE PLYWOOD PROJECT ENTERED IN THE ELEMENTARY-SCHOOL DIVISION OF THE ALGOMA PANEL CO.'S PLYWOOD CONTEST.



REPRESENTATIVE PLYWOOD PROJECT ENTERED IN THE JUNIOR-HIGH-SCHOOL DIVISION OF THE ALGOMA PANEL CO.'S PLYWOOD CONTEST.


Bill of materials
4 posts 1 1/2 x 1 1/2 x 22 1/4
1 bottom shelf, plywood 3/4 x 12 x 26
4 pc. 2 1/4 x 2 1/4 x 3 feet
1 pc. 3/4 x 6 1/2 x 22 1/4 for book trough, plywood
1 pc. 3/4 x 5 3/8 x 22 1/4 for book trough, plywood
2 pc. 3/4 x 2 1/4 x 9 bottom rails
2 pc. 3/4 x 1 3/4 x 9 top rails
2 pc. 1/4 plywood panel 7 1/2 x 18
16 ft. 1/4 panel molding
6 ft. banding for bottom shelf (See F.S. Detail)
6 ft. 1/4 x 3/4 banding for book trough
F. S. DETAIL of BOTTOM
SIDE VIEW
END VIEW
COMBINATION
BOOK and MAGAZINE RACK

REPRESENTATIVE PLYWOOD PROJECT ENTERED IN THE SENIOR-HIGH-SCHOOL DIVISION OF THE ALGOMA PANEL CO.'S PLYWOOD CONTEST.

RECENT DEVELOPMENTS IN SECONDARY AND VOCATIONAL EDUCATION IN THE UNITED STATES

A Résumé of Mr. J. Whitley's Report to the London Education Committee

In offering "Recent Developments in Secondary and Vocational Education" as a subject for study under the terms of the Bush traveling scholarship for the London vocation course in education, Mr. J. Whitley's object was not so much to make an exhaustive survey of the American secondary-school system as it was to collect information on organization and procedure in America which have a direct bearing on the recommendations of the two government commissions which considered the relationship between education and industry and the education of the adolescent.

The research study was begun in January, 1927, and it was early discovered that in order to do the work justice, it would be necessary to follow through the work of the junior high schools on into the senior high schools. The study eventually included the strictly vocational movement which includes the training of workers for industry in the schools; the so-called vocational or prevocational training which is given in the junior and senior high schools of America and the recent developments in vocational guidance in the school system.

Mr. Whitley finds that these three fields of training are part of the vocational movement and that they have been introduced as a result of certain definite economic and social changes in American soicety. Briefly, these changes are: (*a*) the rise of America as an industrial nation; (*b*) the increasing prosperity of the American working classes. To meet the changes the school system has been called upon (*a*) to provide some form of industrial training which will replace the out-of-date apprenticeship system, and (*b*) to cope with a secondary-school population which has increased from 300,000 to 4,000,000 in 35 years.

On the question of what the school system can contribute toward training for industry, the American educationalists are unanimous on one point—that it can contribute a great deal; on the matter of the type of organization which can best function, there is considerable divergence of opinion. It is noted that most of the work is promoted in publicly financed trade, cooperative, and continuation schools, and for the purposes of the report, a short description of these institutions will best indicate the outstanding fields of endeavor.

The Day Trade Schools.

This type of school usually takes boys from the age of 14 upwards and accordingly as the length of the course is two or four years, prepares them for minimum entrance requirements, or for advanced apprentice grade in their chosen trade. The schools are not unlike the English junior technical schools in organization, but more emphasis is placed on skill and manipulative training, and less on technical and related knowledge than is done in England. The general impression is that these schools function best when they offer preparatory training for boys between the ages of 14 and 16, but that when a boy reaches the age of 16, the best training he can get is on the job, supplemented by school instruction on trade-extension lines. The usual range of trades served is printing. engineering, woodworking, and electrical trades, automotive mechanics, and painting and decorating.

The Cooperative Trade Schools

These schools are a new venture and in the opinion of some authorities will eventually supplant the all-day type of instruction. After a short, full-time preparatory training, certain pairs of boys alternate for periods ranging from a week to a month, according to conditions of the trade, between the workshop and school. The employer provides the practical work and the school supplies the technical and related study. Some remarkably good work has been done in connection with the retail selling business in cooperation with the department stores. These schools have an advantage over the all-day type in that the pupils, through working on the job and recognizing what industry expects of them, are more appreciative of the training received. There is little difficulty in placing students in industry and boys are offered permanent positions with the cooperating firm.

The Short-Unit Trade Courses

The purpose of the short-unit trade courses is to take the advanced worker in industry and prepare him for the next promotion within the trade. This upgrading is done in the night school where the worker is employed during the day, or in a short intensive day course covering from one to four months in a trade school. Manipulative skill is given along with much related and technical information which will enable him to reach and to hold the next step. For the ordinary workman who desires to progress in his work, but who has not sufficient previous education to profit from a technical course, the short-unit system provides a wealth of opportunity.

The Continuation Schools

The compulsory continuation schools have been established as a result of laws passed by a majority of the state legislatures. The English-Fisher act was an inspiration to American educationalists, and the failure to put the act into effect was a blow to American education. The continuation schools have had to struggle against bitter and unreasoning hostility, and it is greatly to the credit of those who have had the vision and the courage to put up a good fight, that

these schools are carrying out a program at all. They are getting hold of employed youths and teaching them, not what they have failed to learn in their elementary schooling, but rather the things they will need to know when they reach years of manhood; in brief, to know and to do well the things they will have to do in any case. Only recently have the potentialities of these schools for vocational training been appreciated, and this is due to the cooperation of employers, who have realized that the law has come to stay and have decided to make the best of it. Where the employer is willing to cooperate, and has sufficient boys in his employ to make the scheme feasible, the school is held on the shop floor, and the boys are given training on the job in the half time allotted to vocational work.

It should be noted that no attempt has been made to compare the American system of vocational education with the English technical-school system. The work which the American school authorities are attempting is on a rather different plane from that which the English conceive to be the function of technical education. The English system is providing training facilities largely for those who hope to attain positions of responsibility in industry, and in this respect England has made far more progress than has America. The American school authorities, on the other hand, have specialized on the upgrading of the rank and file of workers, and their experience tends to show that through this program there will be evolved not only a way of training craftsmen for the skilled occupations, but a means of avoiding the danger of labor becoming too static in highly specialized industries. It is expected that the joint committee will at some future time offer suggestions for extending the present technical school system so as to fulfill the dual function of preparing for the higher technical posts and providing for the upgrading requirements of the masses in the industrial population.

The Junior and Senior High-School Work

Up to this point, the work described has been promoted in schools or departments which have as their objective the provision of trade training and which are not intended to improve the general education of the individual. In the junior and senior high schools, however, the instruction is very liberal in character, and a definite attempt is made to adapt the liberal education to the future employment of the student, and to combine with it, as much vocational training as will enable the student to take up productive work immediately upon leaving school.

The junior high school is the outcome of a radical change which has taken place in the aims and organization of general education in the United States. The old system provided for eight years of elementary education, followed by four years of secondary education in the high school. The new organization takes the form of six years of elementary education in the grade school, followed by three years of postprimary work in the junior high school for pupils between the ages of eleven plus and fourteen plus, with a succeeding secondary course of one kind or another in the senior high school. The advantages of this type of organization have been set forth in the report on the education of the adolescent, and in its essentials the work of the junior high school closely follows the committee's plans for a postprimary course in the projected "modern schools."

In this report it has been deemed sufficient to stress the difference between the junior high school and the central or modern school in one single feature. In England, the postprimatry course for most of the students marks the end of the full-time instruction; in the United States, a large proportion of the junior-high-school students pass on to the senior high school. As children of 11 years have no clear idea of what they wish to do, or what they are capable of doing, the main objective of the postprimary course is to help pupils find themselves, and on the results of these findings, to plan for their future. In England, at the age of 11, the pupil is assigned to an immediate secondary education or to employment at the age of 14 years. In America, the postprimary course performs the functions of the first scholarship examination, and by special training toward that end endeavors to guide the pupil into employment or further education suited to his peculiar characteristics. The guidance program, therefore, is strongly emphasized in the junior high school.

Up to the present time, little has been done to develop vocational guidance in the English central schools. A program of this kind seems most essential to a postprimary course which is preparatory to employment. During the formative years, the pupil should be made to think of his future employment; he should have information about the different types of jobs and he should know what each particular kind of occupation will demand of him and what it will offer him in the way of promotion. In the United States, more importance is placed on vocational guidance than on vocational training at this stage. American experience in this direction tends to show that no special training for any occupation can be given effectively in this type of school. The tendency at the present time is to give boys who plan to enter the industries a sampling of the basic trades of woodworking, metal working, electricity, forging, and printing.

Some interesting developments have taken place in the organization of commercial work in these schools. The old bookkeeping, shorthand, and typewriting courses have been abandoned, and in their place have been substituted a junior commercial course, providing a groundwork of business practice and as much training as will enable the pupil of 15 years to do the work expected of him in an office.

Alternatives for the Pupil Completing the Postprimary Course

After the American child has completed the postprimary course, he is permitted to choose one of the following alternatives: (*a*) He may go directly into employment with little actual trade training but a knowledge of what is expected of him in industry; (*b*) he may transfer to a trade school to prepare for entrance into a skilled occupation; (*c*) he may elect an academic course in the senior high school; or (*d*) he may choose to take one of the alternative courses in the senior high school which offer the essentials of a liberal education together with a certain amount of vocational training.

In view of the fact that courses approximating to the last alternative had been suggested for English secondary schools, Mr. Whitley gave some attention to the differentiated curriculum in the senior high schools with the purpose of determining to what extent it might be used with advantage in the English system. It was brought out that the majority of these courses in the United States are still in an experimental stage. The vast majority of these courses, it was noted, although they seem to meet a popular demand in the United States, are nevertheless unsuited to conditions in the English secondary schools. Mr. Whitley was impressed with certain features of the program, particularly the training given to pupils who expect to enter the occupations of commerce, agriculture, and retail selling. The high-school training courses for girls preparing to enter offices or department stores is particularly effective. In the country high schools, the home-project method of teaching agriculture has proved of great value to boys and girls who expect to work on farms.

Mr. Whitley is convinced that trade-preparatory courses may be made to function effectively in a high school. A variety of these courses have been tried out, but few have been particularly successful. Tarde instructors do not appear to mix well with the academic staff, and there seems to be a tendency on the part of the academic pupils to look down on those preparing for "dirty-collar" jobs; the school program is not adapted to give sufficient time for effective trade training, and boys who remain so long in school have difficulty in adapting themselves to the conditions of factory life.

In a later report, Mr. Whitley will describe the trade-preparatory courses in detail, pointing out the advantages and disadvantages resulting from their introduction into the English secondary schools.

HOW THE STATES FURNISH REHABILITATION SERVICE TO HANDICAPPED PERSONS

The Federal Board for Vocational Education, in a statement issued on October 3, goes back into history showing how from the beginning man has been subject to the disabling effects of accident and disease, and how through many centuries society has maintained a feeling of intolerance toward the physically disabled or crippled persons. The present century has witnessed an awakening of society in providing for mentally and physically unfit so that at the present time 41 states in the United States have established services for the vocational rehabilitation of handicapped persons.

The rehabilitation services of these states have been established as educational activities, and as a function of the state departments of education. They cooperate with other state departments, and with numerous private agencies that have something to contribute to the rehabilitation work.

One of the important factors which has hastened the development of a constructive rehabilitation program for the disabled has been the alarming growth of the problem. The expansion in methods of manufacturing by machinery and the speeding up of transportation, with consequent disabling accidents, has brought about a condition which has demanded a remedy. The concern for the worker disabled in industry resulted in the passage in 1911 of a series of state acts for the purpose of compensating the disabled for injuries received at work.

In 1920, 12 states had passed acts providing for the vocational rehabilitation of the industrially disabled. These states are Massachusetts, Nevada, North Dakota, New Jersey, Minnesota, Rhode Island, California, Illinois, Pennsylvania, New York, Oregon, and Virginia.

In recent years there have been developed such organizations as the New York Institute for the Crippled and Disabled, the Cleveland Association for Crippled and Disabled, and the Service League for the Handicapped of Chicago.

THE RELATION OF INDUSTRIAL ARTS TO VOCATIONAL EDUCATION

Can anyone give a good reason why every student in school should not come in contact with and know something about the industrial or vocational life of the community in which he lives, of which he must become a part after graduation?

Mr. Ben E. Harris, state supervisor of trade and industrial education in Alabama, writing in a recent issue of the Georgia *Educational Journal* discusses the relation of industrial arts and vocational education. Mr. Harris does not find fault with the work which has

been done in the past but he does call attention to the needs of the adult workers. He also emphasizes that more attention should be given to the training of the boys and girls of the present in order that it may be unnecessary for them to spend three fourths of their evening time in school to hold a job in which they are employed. He points out that the industrial-arts teacher should not be interested in just keeping the students at work assigned them, but he should study each pupil to determine his likes and aptitudes, and what is best in a vocational way for each one.

Cooperation between the industrial-arts teacher and the vocational teacher is necessary to the well-being of the students, according to Mr. Harris. He holds that the industrial-arts department is a service organization and through service the teacher may and can do the greatest good for his fellowman.

NEW SALARY SCHEDULE FOR VOCATIONAL TEACHERS IN NEW YORK CITY

President George J. Ryan of the New York City board of education recently presented to Mayor Walker the increased salary schedules adopted by the board after a study covering six months. The present salaries relate to vocational and trade schools, continuation schools, and vocational guidance.

Teachers in charge of compulsory continuation schools of fewer than 25 classes will be as follows: One year of service, $4,600; two years of service, $4,800, and three years of service, $5,000.

Teachers in vocational schools for boys will be paid as follows: Principals, with one year of service, $4,800; principals with two years of service, $5,000, and principals with three years of service, $5,200.

Principals in charge of 25 to 48 classes will be paid $6,000 for the first year; $6,250 for the second year; $6,500 for the third year; $6,750 for the fourth year, and $7,000 for the fifth year of service.

Principals in charge of 49 to 84 classes will be paid $6,500 for the first year of service; $6,750 for the second year; $7,000 for the third year; $7,250 for the fourth year, and $7,500 for the fifth year of service.

Principals in charge of 85 or more classes will be paid $7,000 for the first year of service; $7,250 for the second year; $7,500 for the third year; $7,750 for the fourth year, and $8,800 for the fifth year of service.

Teachers of architectural drawing, mechanical drawing, machine-shop practice, printing, sheet-metal work, garment designing, woodwork, electrical wiring, auto repairing, forging, foundry work, patternmaking, plumbing, sign writing, general textiles, weaving and designing of textiles, carpentry, millwork, industrial art, bookbinding, clay modeling, and presswork will be paid $2,148 for the first year of service; $2,304 for the second year; $2,460 for the third year; $2,616 for the fourth year; $2,772 for the fifth year; $2,940 for the sixth year; $3,108 for the seventh year; $3,276 for the eighth year; $3,444 for the ninth year; $3,624 for the tenth year; $3,804 for the eleventh year; $3,996 for the twelfth year; $4,188 for the thirteenth year; $4,404 for the fourteenth year, and $4,656 for the fifteenth year.

Teachers in trade schools for girls will be paid the following salaries: Heads of departments, first year of service, $3,600; second year of service. $3,804; third year, $4,008; fourth year, $4,212; fifth year, $4,416; sixth year, $4,620. Teachers in these departments will be paid $2,148 in the first year of service; $2,304 in the second year; $2,460 in the third year; $2,616 in the fourth year; $2,772 in the fifth year; $2,940 in the sixth year; $3,108 in the seventh year; $3,276 in the eighth year; $3,444 in the ninth year; $3,612 in the tenth year; $3,804 in the eleventh year; $3,996 in the twelfth year; $4,188 in the thirteenth year; $4,404 in the fourteenth year, and $4,656 in the fifteenth year.

Assistant directors of manual training will be paid $4,000 for the first year of service; $4,200 for the second year; $4,400 for the third year; $4,600 for the fourth year; $4,800 for the fifth year, and $5,000 for the sixth year of service.

Assistant directors of sewing will be paid $4,700 for the first year of service; $4,900 for the second year; $5,100 for the third year; $5,300 for the fourth year, and $5,500 for the fifth year.

Assistant directors of continuation schools will be paid $5,000 for the first year; $5,250 for the second year; $5,500 for the third year; $5,750 for the fourth year, and $6,000 for the fifth year.

DIFFERENCES IN WAGES PAID IN AMERICA AND EUROPEAN COUNTRIES

The National Industrial Conference Board of New York City has recently compiled statistics showing the differences in wages paid in cities of the United States and in certain European countries based on 1926 rates. It is shown that wages of masons and bricklayers in Paris have declined from 1923 to 1926, 124.5 hours of work being required at 1926 rates to earn an ounce of gold against 93.2 hours in 1923. London rates have risen, the London mason and bricklayer having to put in only 48 hours in 1926 as against 54.9 in 1923 per ounce of gold in wages. Berlin shows the greatest increase in wage rates, masons and bricklayers in 1926 having to put in only 69.1 hours of work against 124.6 hours in 1923.

The statistics also show that a Paris bricklayer would have to work nearly ten times as many hours to earn an ounce of gold than a Philadelphia bricklayer; while a man in the same trade in London, England, would have to work nearly 28 hours for every eight hours put in by the Philadelphia workman.

In the printing trade, hand compositors in Paris would have to work about 40 hours, in Berlin about 30 hours, and in London about 16 hours to every eight hours worked by their fellow-craftsmen in Philadelphia to earn an equal amount in gold.

The National Board points out that, striking as are the differences in pay when measured in the gold value of the currencies of the different countries, they do not exactly measure the relation of wages paid in the United States and abroad unless related to the living costs in the respective countries in terms of purchasing power. Thus, while the London bricklayer in terms of gold, draws less than one third the wages of the Philadelphia bricklayer, the average purchasing power of the hourly wage in London as measured by food and rent price levels is 60 per cent that of the average Philadelphia wage in similar trades; that in Berlin it is 40 per cent of the Philadelphia wage. Similar figures for Paris are not available.

PERSONAL NEWS NOTES

Mr. C. A. Abbott of Mishawaka, Ind., has been appointed director of vocational education at LaPorte.

Mr. Hugh Ackert is the manual-training instructor at Monango, N. Dak.

Mr. O. D. Adams has been appointed state director of vocational education for Oregon. Mr. Adams succeeds E. E. Elliott who resigned.

Mr. N. C. Allen of Kahoka, Mo., has been appointed director of vocational education at Kirksville. Mr. Allen is succeeded by Mr. W. A. Hook.

Mr. William E. Alley of Bradley Polytechnic Institute, Peoria, Ill., has accepted a position in the new vocational school at St. Louis.

Prof. W. H. Bender, '67, head of the vocational department of the Iowa State College, Ames, Iowa, died of pneumonia following an operation.

Mr. George Billey has been appointed head of the industrial-arts department at Valley City, N. Dak.

New Vocational Board Member at Newark, N. J. Mr. N. A. Carle has been appointed a member of the Essex county vocational board at Newark, N. J., to succeed Mr. Louis Hood.

Miss Grace Colvin has been appointed instructor of manual-arts classes at Marion, Ohio.

Dr. Spright Dowell has resigned the presidency of the Alabama Polytechnic Institute at Auburn.

Mr. A. W. Evans of the Tilden High School, Chicago, Ill., has been elected president of the Illinois Society for Vocational and Practical-Arts Education.

Prof. John C. Ferns of St. Anne, Ill., has been appointed head of the mechanical-drawing department in the high school, Waxahachie, Tex. Prof. Ferns is a graduate of the Northern Illinois Teachers' College, the Illinois Normal University, and the Bradley Polytechnic Institute, and holds a bachelor of science degree given by the latter institution. In addition to his work as a member of the high-school faculty, Prof. Ferns also acts as director of the school orchestra.

Mr. Edward T. Franks of Kentucky, has been appointed a member of the Federal Board for Vocational Education.

Mr. Frank Frick acts as assistant manual-training instructor at Mitchell, S. Dak.

Mr. Robert Frick is the manual-training instructor at Clark, S. Dak.

Mr. Gladstone Califf of Highland Park, Ill., has been appointed manual-training instructor at Quincy.

Mr. Raymond Greenway has been appointed instructor in manual training in the high school at Dubuque, Iowa.

Mr. Harvey N. Hyde of Omro, Wis., has been appointed manual-training instructor at Montevideo, Minn., to succeed Homer Mason.

Mr. Royal Hayden has accepted the position of head of the industrial-arts department at Jamestown, N. Dak. Mr. Hayden is a graduate of the mechanic-arts department of the State Normal and Industrial College, Ellendale.

Mrs. Helen W. Hazen has been appointed as head of the New Jersey department for the training of home-economics teachers under the Smith-Hughes law. Mrs. Hazen was formerly principal of the Essex county vocational school for girls, Elizabeth, N. J. Mrs. Hazen is succeeded in Elizabeth by Miss Caroline Nourse, who was formerly in the state education department of Massachusetts.

Mr. W. M. Heckmann of Bellingham, Wash., has been elected assistant professor of industrial education in the department of mechanic arts of the State Normal School, Ellendale, N. Dak.

Mr. W. H. Henderson, formerly principal of the Austin Junior High School at El Paso, Texas, and director of the Vocational School, will devote his entire time to vocational work during the school year 1927-28.

Mr. Clifford Hernes is the instructor in manual training at Ledgerwood, N. Dak.

(Continued on Page 38a)

NOW, ARE THERE ANY QUESTIONS?

Address Wanted

748. Q.: We would like to get in touch with a publication called *Science and Craft*, but which we are unable to locate. If you can give us the address of this magazine, we will appreciate it very much.—*F. L. R.*

A.: *Science and Craft* is published by R. T. Crane High School, 2245 Jackson Blvd., Chicago, Ill.

Finishing Maple and Gumwood

749. Q.: What are your suggestions on finishing hard maple and gumwood in imitation of walnut and mahogany?—*J. K.*

A.: For hints of finishing gumwood see INDUSTRIAL-ARTS MAGAZINE, page 177, April, 1917; page 170, April, 1923; page 214, May, 1923.

For finishing maple see INDUSTRIAL-ARTS MAGAZINE, page 286, July, 1918; see also "Expert Wood Finisher," $3. A. A. Kelly, Malvern, Pa., and "Instructional Units in Wood Finishing," by R. A. McGee. Price $1.60. Published by The Bruce Publishing Co., Milwaukee, Wis.

Artisan and Craftsman

750. Q.: Please explain the difference between an artisan and a craftsman.—*E. R. C.*

A.: A careful search in both American and English dictionaries shows that these two words are practically synonymous. The meaning of artisan originally pertained to one who practiced an art but it has since been adopted as meaning also one who practices a mechanic art, a mechanic, a handicraftsman.

Sewing Cabinet, Spinet Desk, Educational Helps

751. Q.: I am anxious to secure a copy of your magazine which contained a drawing of a Priscilla sewing cabinet published sometime in 1922. I also would like to obtain the name of a firm which sells woodworking materials, cut ready for assembling. I am furthermore looking for a drawing of a spinet desk.

I am interested in educational helps that would aid me in my work as manual-training teacher.—*E. N. W.*

A.: The Priscilla sewing cabinet to which you refer can be found on page 200 of the May, 1922, issue of the INDUSTRIAL-ARTS MAGAZINE. Another one was illustrated and described on page 179 of the May, 1926, issue of the same magazine. Spinet desks can be found in the same magazine on page 346 of the Sept, 1922, issue and page 59 of the Feb., 1925, issue.

"Red-i-Kut" furniture for school shops can be obtained from the Kuempel Company of Guttenburg, Iowa.

Articles which will be helpful to manual-training teachers can be found in the following back numbers of the INDUSTRIAL-ARTS MAGAZINE: "Lesson Plan for Teachers," Bowman, p. 377, Sept., 1916; "General Project Method of Teaching," Whitcomb, p. 131, April, 1920; "Suggestions for Organizing Teaching Material," Van Gaasbeck, p. 146, April, 1923; "Allen and Selvidge Methods of Teaching," McDonald, p. 414, Nov., 1923; "Newark Plan of Teaching," Backus, p. 489, Dec., 1923; "Lesson Plan and Job Sheets," Bowman, p. 125, April, 1924; "Job Sheets and Operation Sheets as Teaching Devices," Phillips, p. 321, Sept., 1925; "Instruction Sheets in Teaching," Fryklund, p. 41, Feb., 1927; "The Teacher's Plan," Selvidge, p. 79, March, 1927; "Some Teaching Helps for Teachers," Sowers, p. 347, Sept., 1927; "How to Use the Question in Teaching," Snaddon, p. 451, Dec., 1927.

The following books will be found very helpful:

McMurry, Eggers & McMurry's "Teaching of Industrial Arts," $2, The Macmillan Co., New York City; Edgerton's "Industrial Arts and Prevocational Education," 80 cents, Bruce Publishing Co., Milwaukee, Wis.; Worst's "Industrial Work for the Middle Grades," $3.50, Bruce, Milwaukee, Wis.; De Vette's "One Hundred Problems in Woodwork," $2.40, Bruce, Milwaukee; Tustison's "Job Sheets in Practical Woodwork," 56 cents, Bruce, Milwaukee; Worst's "Problems in Woodwork," $2.50, Bruce, Milwaukee; Smith's "Industrial Education in Minnesota," $1, University of Minnesota, Minneapolis; Haynes' "Teaching Shopwork," $1.40, Ginn & Co., Boston; Selvidge's "How to Teach a Trade," $1, Manual Arts Press, Peoria, Ill.; Bennett's "Teaching the Industrial Arts," $1.50, Manual Arts Press, Peoria, Ill.; Griffith's "Teaching Manual and Industrial Arts," $2, Manual Arts Press, Peoria, Ill.; Vaughn and Mays' "Content and Methods of the Industrial Arts," $2, The Century Co., New York City.

Plans for Surf Board

752. Q.: Can you inform me where I can obtain plans and specifications for the construction of an aquaplane or surf board?—*R. C. W.*

A.: You may probably get information on these subjects from the *Popular Science Monthly*, 250 Fourth Avenue, New York, N. Y., and *Science and Invention*, 230 Fifth Avenue, New York, N. Y.

Thinning Liquid for Lacquer

753, Q.: Will you kindly advise me what liquid can be used to thin lacquer and wash out the brushes that have been used in lacquer?—*G. F. V.*

A.: Your questions are answered admirably in an article on "Modern Lacquer Materials and Their Application," by R. G. Waring, on page 134 of the April, 1927, issue of the INDUSTRIAL-ARTS MAGAZINE.

The commercially prepared thinner which is used for thinning lacquer is probably the best substance to use for cleaning the brushes.

Aquarium Cement and Knifemaking

754. Q.: What cement can be used in the construction of small aquariums?

Is an old worn-out file suitable steel for forging a hunting knife? If so, at what color should it be hardened and at what color heat should it be tempered?

In buying steel for knives what is a good kind?—*J. R. M.*

A.: The aquarium cement can be made by thoroughly mixing the following ingredients: Litharge 3 parts by weight, fine white sand 3 parts by weight, plaster of paris 3 parts by weight. Rosin in powder form 1 part by weight. After these have been thoroughly mixed, add enough boiled linseed oil to make a paste. Then add a small amount of japan drier. The mixture should be allowed to stand about 1 hour before using.

Your questions on the making of knives are answered in the Industrial-Arts Brochure No. 9, entitled "Knives, How to Make Them in the School Forge Shop," by J. F. Knowlton, published by The Bruce Publishing Company, Milwaukee, price 35 cents. There also is an article on what to do with your old files by O. E. West, on page 366 of the October, 1926, issue of the INDUSTRIAL-ARTS MAGAZINE.

Hardness of Teak and Lignum Vitae

755. Q.: In an article from the *Detroit Times* of October 8, 1927, there appears an item stating that teak is the hardest wood. I have always believed that lignum vitae is the hardest wood. Can you give me any information on this?—*J. H. B.*

A.: Teak is quite similar to oak in density, specific gravity, and its mechanical properties. Lignum vitae, on the other hand, is one of the heaviest woods in the world. Its oven-dry weight per cubic foot is reported to be between 75 and 80 pounds, which gives a specific gravity of between 1.20 and 1.28. It is unquestionably harder than teak and our native oaks, but beyond this we have no specific information concerning it. You may refer to Technical Bulletin No. 1-25, "Teak, Its Habitat, Exploitation and Marketing," by Lieutenant Wendell P. Roop. This bulletin is dated February 1, 1925, and is issued by the Navy Department, Bureau of Construction and Repair, Washington, D. C. Also to Bulletin No. 6, Yale University, School of Forestry, "Lignum Vitae," by Samuel J. Record.

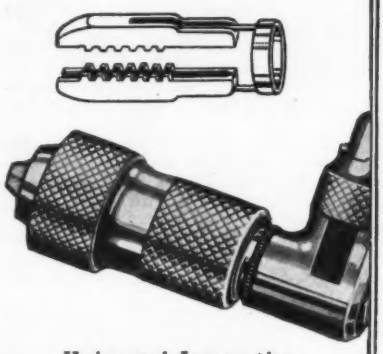
Will Offer Prizes for Apprentice Printers. With a view of inspiring young men to become leaders in the printing industry, Mr. Henry A. Wise Wood has offered the board of education the sum of $600, to be awarded to apprentices in the school of newspaper pressmen, a department of the Central Printing Trades School of New York City.

Of the prizes offered, the sum of $150 is to be awarded to the graduate receiving the highest rating in scholarship. Individual prizes of $25 each will also be given for the best record of attendance, to the graduate receiving the highest rating in the final written test. There will also be first, second, and third prizes of $75, $50, and $25 for the best ideas given on any practical improvement in the mechanism of the newspaper press. Five prizes of $20 will be given to each of the five students rating the best in practical efficiency.

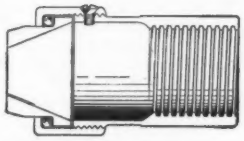
In addition to these, there are also special prizes for encouraging leadership, consisting of a first prize of $50, a second prize of $30, and a third prize of $20, to be awarded to the three apprentices receiving the highest number of credits on the point system.

Mr. Wood has provided help for the students through a series of magazines for the reading room, and for the teachers he has supplied a shelf of recent publications on vocational pedagogy.

Two types of bit braces for school shops



Universal Jaws—the forged and hardened steel jaws are controlled by springs held in the collar as shown. The springs are outside of the chuck body, therefore, entirely protected from the bits, eliminating chuck trouble.



Ball Bearing Shell—The balls in the shell enable the user to tighten all kinds of bits more quickly and securely. The release is easier as the friction on the jaws is reduced to a minimum.

Box Ratchet—Concealed Ratchet

The two tools shown on this page represent the latest developments in bit brace design. Each has a ball-bearing chuck, universal jaws, metal-clad ball-bearing head. Nickel plated. Head and handle are made of cocobolo.

With their ball-bearing chucks and special spring construction for holding the jaws, these two bit braces will make worthy additions to any school shop. They will hold round-shank bits from ⅛" to ½", Morse taper-shank bits and the large square-taper shanks of expansive bits.

The Stanley Catalog No. 34 should be in the hands of every Manual Arts or Vocational Supervisor or Instructor. It lists and shows pictures of over 1500 items, as well as detailed drawings of their construction and adjustment.

In addition, the appendix gives a number of tables covering subjects pertinent to woodworking.

You should have a copy of this catalog by all means. Send for yours today.

THE STANLEY RULE & LEVEL PLANT
Educational Department
NEW BRITAIN CONNECTICUT

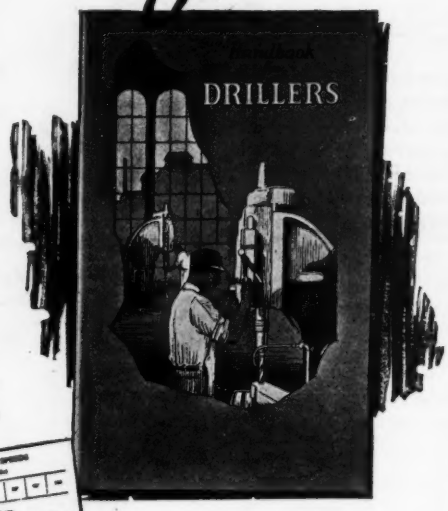
STANLEY
Ratchet Bit Brace
No. 813, Box Ratchet
5 sizes: 8, 10, 12, 14
and 16 inch sweep

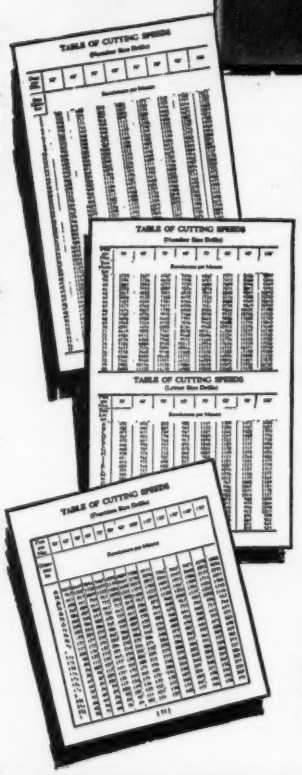
STANLEY
Ratchet Bit Brace
No. 811, Concealed Ratchet
3 sizes: 10, 12 and
14 inch sweep

STANLEY TOOLS

STANLEY EQUIPMENT IS STANDARD EQUIPMENT

Do you know the right drilling speeds?





AT what speed and feed should a 1/16-inch carbon steel drill be started? A 1/4-inch high speed steel drill? What is the difference in the starting speeds when drilling in machinery steel, brass and cast iron? How many revolutions per minute does a 5/16-inch drill make operating at a speed of 50 feet per minute?

All of these questions are answered for you on pages 32 to 35 of the Handbook for Drillers, which Vocational School Directors and Instructors tell us is the most authoritative textbook on twist drills and drilling practices published.

As our contribution to vocational education, we want to send copies of this Handbook, in any reasonable quantities, to Directors and Instructors for use in their machine shop classes.

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TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.

ASSOCIATION AND CONVENTION ACTIVITIES

MANUAL-ARTS CONFERENCE

The eighteenth manual-arts conference was held December 1, 2, and 3 at Chicago. Dr. Wm. T. Bawden, associate superintendent of city schools, Tulsa, Oklahoma, was the general chairman.

The conference was attended by 42 members representing educational institutions in 13 different states.

The first session was presided over by K. G. Smith, state department of education, Lansing, Mich.

The subject for discussion was "The Relation Between Vocational-Industrial Education and the Manual Arts."

The speakers were C. S. Van Deusen, State Teachers' College, Kent, Ohio; G. E. McLaughlin, Ohio University, Athens, Ohio; A. V. Larson, State Teachers' College, Peru, Nebr.; J. G. Grove, State Teachers' College, Commerce, Texas.

The subject of "State Licensing Laws as They Apply to the Manual-Arts Teacher," was discussed by the following: L. F. Ashley, State Teachers' College, Charleston, Ill.; K. G. Smith, state department of education, Lansing, Mich.; and Geo. K. Wells, State Normal School, Terre Haute, Ind.

L. W. Wahlstrom, of the F. W. Parker School, Chicago, was the chairman of the second session, at which the subject of "Individual Instruction Sheets" was discussed by James McKinley, American School, Chicago; L. V. Newkirk, State University, Iowa City, Iowa; and C. A. Bennett, Manual Arts Press, Peoria, Ill.

C. S. Van Deusen, State Teachers' College, Kent, Ohio, presided over the third session at which the subject was "Progress in the Preparation of Teachers of Manual Arts and Industrial Education."

M. J. Sherwood reported on activities at the State Normal School, W. H. Stone on those at the Ohio State University.

Geo. K. Wells, State Normal School, Terre Haute, Ind., led in the discussion.

Arthur B. Mays, University of Illinois, summarized the discussions of the first day.

The fourth session was presided over by H. H. Braucher, University of Illinois.

The subject under discussion was "Practice Teaching" and H. H. Braucher, University of Illinois; DeWitt Hunt, State A. & M. College, Stillwater, Okla.; C. L. Jackson, State Teachers' College, Emporia, Kans.; and M. E. Franklin, State Teachers' College, Talequah, Okla., presented papers.

At the same session, under the chairmanship of A. F. Siepert, Bradley Institute, Peoria, Ill., the question of "Shop Planning" was discussed by Ammon Swope, Purdue University, Lafayette, Ind., and H. T. Wilhite.

Athe fifth session, James McKinney, American School, Chicago, was the chairman.

F. C. Whitcomb, Miami University, Oxford, Ohio; A. B. Mays, University of Illinois; R. W. Selvidge, University of Missouri; and Victor Randel, State Teachers' College, Huntsville, Texas, discussed "The Significance of the Manual Arts in the Junior-High-School Program."

R. H. Rodgers, Chief of Division of Teacher Training and Research, Milwaukee Vocational School, was chairman of the sixth session at which "The Training of Teachers in Service" was discussed.

A. F. Siepert, Bradley Institute, Peoria, Ill.; R. H. Rodgers, Milwaukee Vocational School; W. E. Roberts, board of education, Cleveland, Ohio; E. E. Phillips, University of Missouri; and W. T. Bawden, Tulsa, Okla., presented papers on the subject.

R. W. Selvidge, University of Missouri, summarized the work of the second day.

At the seventh and last session under the chairmanship of W. H. Stone, Ohio State University, the subject of "Vocational Guidance and the Manual-Arts Teacher" was discussed by K. G. Smith, State Department Education, Lansing, Mich.; E. W. Bollinger, University of North Dakota, Grand Forks; D. H. Kelly, State Department Education, Indianapolis, Ind.; G. N. Boone, McPherson College, McPherson, Kans.

A short business session followed this discussion, after which Charles A. Bennett, editor of the *Industrial Education Magazine*, summarized the deliberations of the conference.

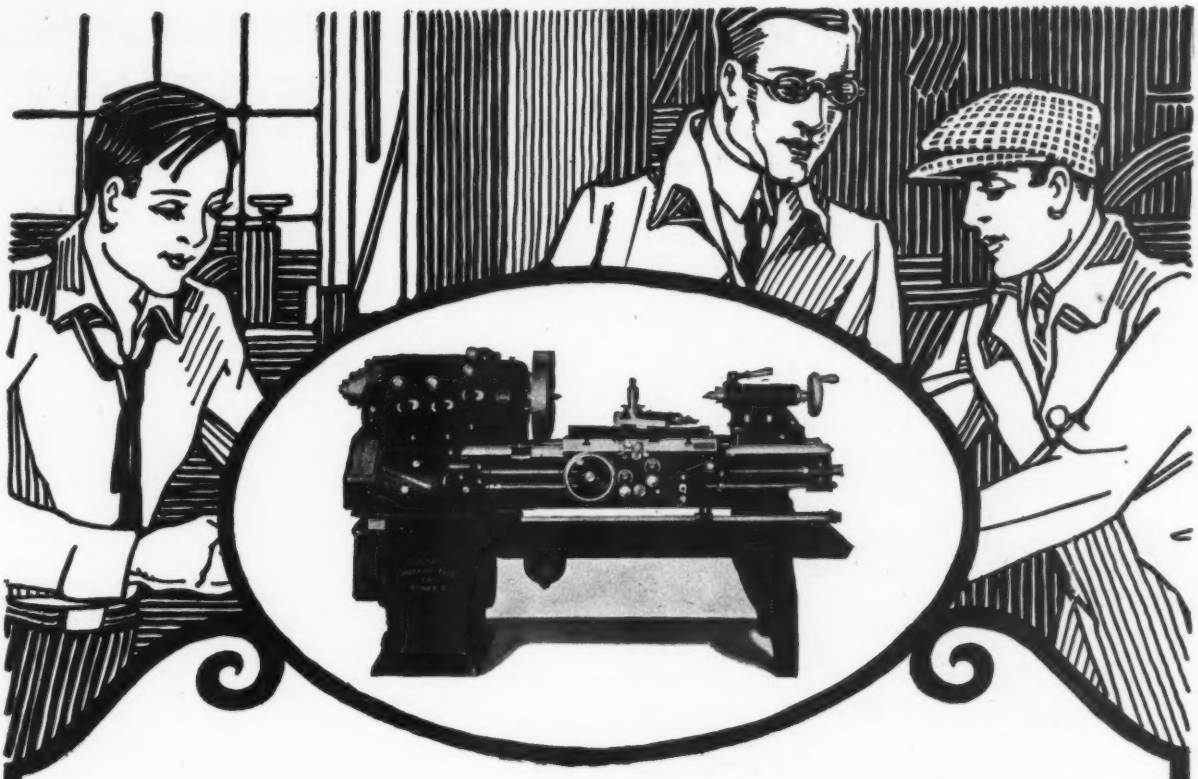
THE ILLINOIS VOCATIONAL AND PRACTICAL-ARTS CONVENTION

The Illinois Society for Vocational and Practical-Arts Education and the Illinois Home Economics Association held a joint convention at Chicago on November 11 and 12.

The meeting of the industrial-education section opened at 9:30 a.m. by Chairman L. J. Lease.

Fred J. Hartman, director of the department of education, United Typothetae of America, Chicago, discussed the question "Does the Printing Industry Want the High-School Boy?" The speaker pointed out that the printing industry was thoroughly sold on education; that they had started their educational program fully 15 years ago; that

(Continued on Page 32a)



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Train your students on MONARCH LATHES and when they go from your school they will be ready for their jobs —valuable men immediately without the necessity of going through another period of training in the shop.

The student that is trained on a Monarch Lathe is trained in actual shop practice — for the Monarch is the first choice of Industrial America. Today more Monarch Lathes are being sold to industrial plants than any other lathe built.

The Monarch motor-driven, helical geared Lathe is the ideal equipment for instructional purposes. It is far in advance of other lathes in design. It is as near danger-proof as any lathe can be made. It is as noiseless as any lathe can be—an important advantage in the instruction room.

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Hardened steel block, with V-shaped grooves, holds round or irregular shapes.

The Handiest Vise in the World

Even if you have other vises, you need this "Yankee," because you can do work with it that is impossible with any other—and do it with speed, accuracy and ease.

Not only has a swivel base so you can turn it around in any position, but detaches from its base. You don't have to remove work from vise until entire job is completed—simply lift vise, work and all, off base, and carry to drill press, milling machine, etc.

Sides, ends, bottom and top are machined true. Work is kept in perfect alignment at all times. Cam-throw lever locks vise in any position.

No. 1994—Jaws open 4 in. **No. 1992**—Jaws open 1⅛ in.
No. 1993—Jaws open 3⅛ in. **No. 1991**—Jaws open 1½ in.

Some Other "Yankee" Tools

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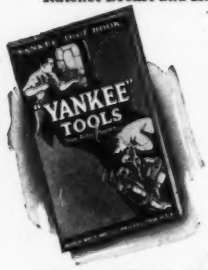

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"YANKEE" TOOLS

Make Better Mechanics

(Continued from Page 30a)

the craftsmen's movement which was started in 1919 had set up the slogan "Share your knowledge."

He pointed out that the industry was interested in obtaining high-school boys as apprentices. These boys had a broader knowledge of life, some literary and historical background, could do at least some independent thinking, and were prepared to profit by an apprenticeship which would fit them to fill the journeymen positions well, and if opportunity offered, to also take care of managerial and executive positions.

Harry J. Krusz, assistant general manager of the Commonwealth Steel Company, Granite City, discussed "Safety in the Vocational School." He emphasized that now, where industry is fully alive to the importance of accident prevention, the school must assist in carrying out the idea 100 per cent. Not only must school machinery be well guarded, but the pupils must be taught to think safety at all times. He also pointed out that the schools should invoke the aid of the national safety council, Underwriters' Association Insurance Co., and industry to make safety instruction vital and far reaching.

A. J. Heinmiller, supervisor of apprentice training, Caterpillar Tractor Co., Peoria, Ill., discussed "Apprentice Training in Industry."

Wm. J. Bogan, assistant superintendent of schools, Chicago, gave the address of welcome at the general session. At this session, Albert G. Bauersfeld, director of technical work in high schools, Chicago, spoke on "The Present Status of Practical-Arts Courses in Secondary Schools."

Edward F. Worst, director of manual training in junior high and elementary schools, Chicago, discussed "The Influence of the Elementary Manual-Training Teacher."

Other speakers were William F. Rasche, professor of vocational education, University of Pittsburgh, on "The Practical-Arts Teacher's Opportunity"; Arthur B. Mays, associate professor of industrial education, University of Illinois, on "The Vocational Teacher's Duty"; and L. P. Elliott, supervisor of industrial education, Peoria, on "Methods of Interesting Parents and Employers."

The subjects discussed on Saturday included the following: "What the Supervisor or Director Can Do," J. F. Kolb, state supervisor of industrial education; "What the Principal Can Do," R. W. Selvidge, professor of industrial education, University of Missouri; "Self-Improvement of the Teacher," L. W. Wahlstrom, director of manual arts, Francis Parker School, Chicago; "The Benefits of Active Membership in One's State Association," Edwin A. Lee, president of the American Vocational Association.

At the afternoon session, J. C. Gambach, head of the manual-training department, Peoria Township high school, presided over the industrial-education section.

At this meeting H. D. Campbell, instructor in drafting, Morton Township high school, Cicero, spoke on "Drafting Material Derived from Industrial Standards," and R. W. Selvidge, professor of industrial education, University of Missouri, spoke on "Individual Differences and Individual Instruction."

There were also sectional meetings on part-time education, personnel and guidance, printing, art, and commercial education.

WISCONSIN TEACHERS' ASSOCIATION CONVENTION

The seventy-fourth annual meeting of the Wisconsin Teachers' Association was held on November 3, 4, and 5 at Milwaukee.

The vocational section met at 2 p.m. on November 3, at the Milwaukee Vocational School auditorium. Dr. R. L. Cooley, director of the Milwaukee Vocational School, was the chairman.

Edwin A. Lee, president of the American Vocational Association, was the principal speaker.

He emphasized the fact that the interrelation of home, industry, and commerce made vocational education necessary, and pointed out that successful performance in the field for which one is trained is the real aim of all vocational education.

He urged the vocational teachers to keep abreast of the modern vocational-education and guidance movements and not to forget that there was no royal road to the making of a vocational choice. That above all, the child must not be robbed of the gift of this choice.

He cautioned also that the curriculum of the vocational school should be sanely set up and pointed out the folly of training for occupations that do not exist in the community.

Dr. Cooley urged the rank and file of the vocational teachers of the state to do all in their power to further the activities of the American Vocational Association, since every vocational teacher profits by the national movement.

The manual-arts section held its meeting at 2 p.m. on November 4 at Walker Hall in the city auditorium. W. E. Roberts was the chairman. W. F. Schenke, Marinette, started quite a discussion when he stated that teachers' conventions were futile unless they discussed the real problems which confront those who are engaged in the teaching profession. He urged that annual convention programs be so set up that the subject matter discussed would really assist instructors to function more efficiently in their classroom.

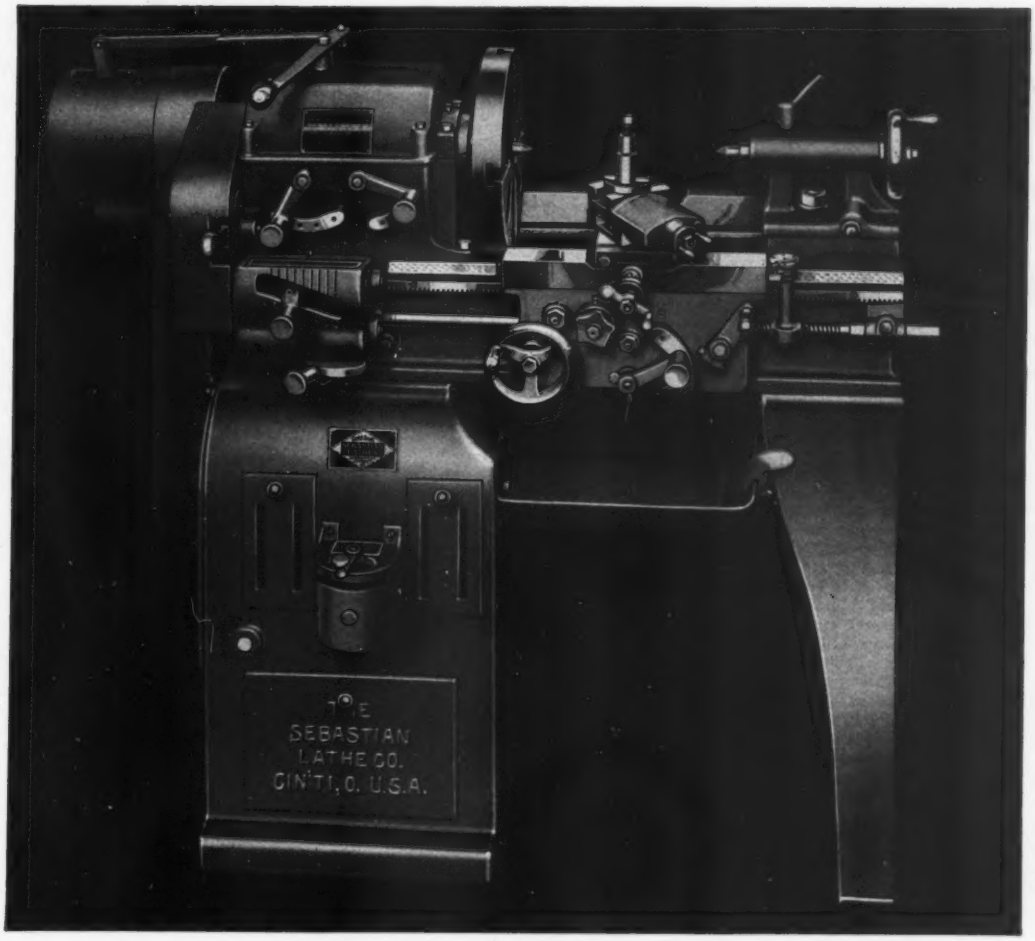
At the business meeting which followed, Mr. Schenke was elected president of the manual-arts section for the coming year. He

(Continued on Page 37a)

NEW NEW NEW

The Finest Modern Lathe

"A Boy Cannot Break It."



11-inch GOLD SEAL HEAVY DUTY LATHE

3'-4'-5'-6' Bed Lengths Swing over Bed 12-1/16"

For the School

In this lathe are incorporated so many new features especially designed with the school shop in mind, that it is an ideal small lathe for school purposes. The motor is placed in the leg underneath the headstock. The drive is of new design and foolproof. The lathe is solidly steel geared throughout, with safety features incorporated.

An Entirely Different Machine

from any other on the market today. It does the work of a small high-speed lathe and a fine precision lathe with all the engine lathe features. It has been our aim with this lathe to put out the very finest machine on the market.

For the Tool Room

The new 11-in. Gold Seal Heavy Duty Lathe is a precision lathe for your tool room work. Graduations at every point for precision work. It is aligned within an accuracy of .0005. Takes collets up to a size equal to the average 14-in. lathe as it will take up to ⅞ in. Has a 1¼-in. hole through spindle.

For more complete information ask for our illustrated Descriptive Bulletin

The Sebastian Lathe Company

Cincinnati, Ohio

Coupon

The Sebastian Lathe Co.,
Cincinnati, Ohio.

Send descriptive Bulletin of your New 11-inch Lathe.

Name.....

Position.....

St. & No.....

City..... State.....

IAM-1

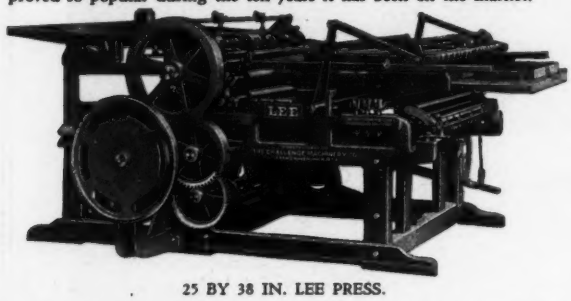
SCHOOL SHOP EQUIPMENT NEWS

For the Supervisor and Teacher who desires to keep abreast with news of new Machinery, Tools, Supplies, etc.

ANNOUNCE NEW LARGE SIZE LEE PRESS

The Challenge Machinery Company of Grand Haven, Mich., has announced the marketing of a new large size Lee cylinder press, to be had in the carrier delivery (printed side up) style only, and to be known as the 25 by 38-in. Lee Press.

The new size has been evolved because of a demand for this size, which is a little larger than the 24 by 36-in. press which proved so popular during the ten years it has been on the market.



25 BY 38 IN. LEE PRESS.

The Lee Press is made in a variety of styles and sizes. It is a simple, easily handled, and moderate-priced two-revolution press which is capable of handling all kinds of commercial, book, and color work and performing it in the best and most economical manner.

HAND-LOOM WEAVING FOR SCHOOLS

Hand-loom weaving is one of the lucrative occupations into which any man or woman may enter without giving up their personal freedom or investing a large sum of money. The most successful home weavers started in weaving as a mere pastime but later were able to build up a very profitable business.

The subject of weaving is being taught quite extensively in the schools at the present time. In a number of cases, schools are teaching weaving as a part of the regular course in industrial arts, or as training and occupational work for retarded and handicapped children in the special classes.

In the teaching of weaving as a handicraft, it is advisable to limit the activities to articles which are directly practical and which may be easily disposed of on the public market at reasonable prices.

Among the especially useful projects which may be attempted are porch mats, table mats, couch covers, and a variety of woven rugs for use in homes, sunrooms, and cottages.

As a means of promoting the weaving business in general and giving assistance to schools, institutions, and others interested in weaving as an occupation, the January and Wood Company of Maysville, Ky., has issued several pamphlets dealing with the subject of weaving and its practical applications. One pamphlet entitled "A Weaver's Manual," describes the process of weaving, tells the kind of articles to weave, and offers a list of special weaving terms. A second pamphlet entitled "The Vogue of Handwoven Rugs in Home Decoration," offers a number of rug-weaving patterns, using borders of different colors and designs, and one or more warp colors. The booklet tells how to prepare materials for weaving, the amount of rugs required, color properties, and the special uses of rugs in the ordinary home.

NEW LINE OF WOODWORKING MACHINERY FOR SCHOOL SHOPS

The Oliver Machinery Company of Grand Rapids, Mich., has issued its new Catalog No. 24, describing and illustrating the Oliver junior line of woodworking machinery. The equipment includes saw benches, band saws, planers and jointers, and tool grinders which are especially adapted for use in school shops. The machines are manufactured on the same high standards which have built the larger machines and are guaranteed both as to material and workmanship.

The Oliver Company manufactures also disk sanders, vises, clamps, gluepots and heaters, and oilstone grinders.

"THE SAW KERF"

E. C. Atkins & Company of Indianapolis, Ind., have issued a twenty-page publication, entitled "The Saw Kerf." The paper aims to publish articles with the idea of helping to obtain forest-fire protection by federal, state, and other agencies; reforestation of denuded lands; more extensive planting of trees by individuals, companies, and the government, and the advancement of sound remedial forestry plans for posterity. It also seeks to provide information relating to the proper use of saws and machine knives, and the education of individuals who have occasion to use saws and machine knives, in order that they may obtain maximum results without waste of time, material, or money.

The present issue discusses chain saws, the care of small circular rip and cut-off saws, and light and heavy strain on band mills, and why.

DRAWING INKS AS APPLIED TO ART AND ARCHITECTURE

Under the title "Technics," the Charles M. Higgins Company of Brooklyn, N. Y., has issued an intensely interesting and practical twenty-page booklet illustrating color and its part in architectural presentation through the use of colored drawing inks.

The booklet has been prepared as a special help to the architect, draftsman and student, and indicates the numerous uses for Higgins' drawing inks in the preparation of perspectives, landscapes, and specifications. Both rendering in color and black-and-white-treatments are shown by means of splendid illustrations of types of work executed in Higgins drawing inks.

The Higgins Company offers to send a free copy to any architect, engineer, or draftsman who will address the firm at 271 Ninth Street, Brooklyn, N. Y. The booklet will be sent to other interested persons at the price of 25 cents each.

New 11-In. Gold Seal Heavy-Duty Lathe

The Sebastian Lathe Co. of Cincinnati, Ohio, has placed a new lathe on the market which ought to be of special interest to schoolmen. It is known as the 11-in. Gold Seal heavy-duty lathe. It is equipped with a motor built in the leg underneath the headstock, and the cabinet is placed beneath the motor. It is designed to be as

NEW 11-IN. GOLD SEAL HEAVY-DUTY LATHE.

nearly boy-proof as it is possible to make a lathe. The feeds cannot be thrown in simultaneously, and a safety shear pin protects the gears in the quick-change box. All gears are of steel, and the change box is equipped to cut from 6 to 96 threads. It swings 12⅞ in. over the bed, and 8⅜ in. over the carriage, and it can be obtained with beds, 3, 4, 5, or 6 ft. in length.

Scholarships in Industrial Chemistry. The School of Science and Technology of Pratt Institute, Brooklyn, New York, has awarded scholarships to members of the second-year class in industrial chemical engineering. Paint and varnish scholarships have been awarded to Mr. L. V. Glomb and to Mr. W. S. Woodward.

Wins Prize in Cabinetmaking. Henry Baker recently won the craftsmanship medal of the Dewey Junior High School for an excellent piece of cabinetmaking. The project was a spinet desk, 24 by 42 in. on the top and 30 in. high, with a complete set of pigeon holes at the back and a large drawer at the front. The top is piano hinged and is a fall-back construction. The entire trimming is nickel.

Wins First Prize in Painting. Erwin Mauch, a student under Mr. Henry Wagner, in the painting and decorating class of the Milwaukee Vocational School, Milwaukee, Wis., was recently awarded first prize of $5 for the best panel exhibited at the last convention of the State Association of Painters and Decorators.

(Continued from Page 32a)

was empowered to appoint a committee to draft a constitution and by-laws for a state manual-arts association.

A round-table discussion on the teaching of vocational academic subjects was held on November 4, a 2 p.m. at the Vocational school under the chairmanship of Yerda T. Harris, La Crosse. The teaching of English and social science in the part-time school, and pupil's attainment were discussed.

At the business section of the representative assembly of the Wisconsin Teachers' Association, Dr. R. L. Cooley, director of the Milwaukee Vocational School, was elected president for the coming year. B. F. McCornick, Madison, was elected secretary to succeed Edgar G. Doudna.

NEWS AND NOTES

Vocational Work Expanded in Fresno. The public-school system at Fresno, Calif., has begun an extensive industrial education program due to the increasing interest of the general public in this form of instruction. The Fresno schools offer opportunity to take both the vocational and industrial courses. Industrial courses are given in all the junior high schools, the Edison Technical School, and the Fresno High School. The work in the high school was begun with the opening of the term in the form of general shopwork, under the direction of Mr. Tom Tetstall. The vocational work is limited to the Fresno Technical Schools and offers trade training in automotive electricity, electricity, machine-shop practice, and cabinetmaking. A further course in carpentry will be offered during the second term. In Fresno the vocational-education program is related to the community and is conducted under the direction of Mr. A. W. Miller as director, and Mr. H. C. Wienke as assistant director.

Art Department in St. Louis Vocational School. The new vocational school which is being conducted in the Central High School at St. Louis, Mo., includes an art department where students of the high school may begin their art education in preparation for more advanced work. Students in this department attend school a half day, a full day, four evenings each week, or for a complete course covering both day and evening work. Students who complete the elementary course may take up advanced work leading to advertising illustration, magazine and newspaper artwork, and painting. The school is under the direction of Miss Jessie Geyre.

Evening Vocational Classes at Schenectady. The evening vocational school at Schenectady, N. Y., is offering courses in carpentry, cabinetmaking, sheet-metal work, electric wiring, machine-shop practice, mechanical drafting, building-trades drafting, industrial mathematics, plumbing, printing, dressmaking, homemaking, and home nursing.

Evening Vocational Courses at Madison. The trade and industry department of the Madison Vocational School, Madison, Wis., is offering a number of courses in its evening school for the benefit of apprentices and tradesmen and beginners. Individual instruction is given to permit students to progress according to their ability. Among the courses offered are architectural drawing for carpentry apprentices, printing, electricity, and blue-print reading.

Evening Vocational Classes at Irvington, N. J. The evening school of the Essex County Vocational School at Irvington, N. J., is offering shop and technical courses in automotive mechanics, electricity, printing, machine-shop practice, blue-print reading, carpentry, cabinetmaking, and mechanical drawing. Special courses in carpentry, electricity, machinery, and painting and decorating have been organized for apprentices in those trades.

Evening Classes at Paris, Ky. The evening school at Paris, Ky., is offering courses in blue-print reading, use of the steel square, automobile mechanics, and one for truck and taxi drivers.

Vocational Evening Courses at Palm Beach, Fla. The evening vocational school at Palm Beach, Fla., is offering courses in sheet-metal work, plan reading, architectural drawing, ornamental plastering, automobile mechanics, steel square, and dressmaking.

St. Paul Vocational School Teaches Watch Repairing. The Vocational School at St. Paul, Minn., has enrolled 32 students in the course of watchmaking and repairing. The course begins with a historical review of watchmaking, which is followed by studies and experiments with brass and other metals, the use of instruments, and the making of tools. Gradually the student turns to clocks of different kinds, and finally works into the repair of watches, supplementing the mechanical training with scientific studies. Practically all clock repairs for the city hall and in schools where automatic systems have not been installed, are made by the students without cost of labor.

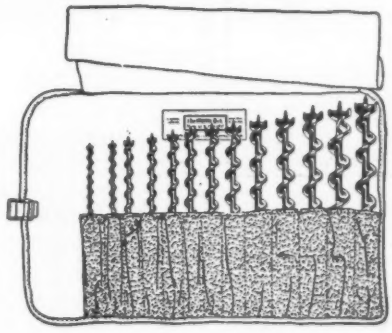
It is claimed that 75 jewelers doing $250,000 worth of watch repairing annually employed ten students of the school last year. More than 50 of these jewelers employ from one to twelve watchmakers each, totaling 120, and some twenty students complete repair-work involving a quarter of a million dollars a year. Graduates of the vocational school command higher wages than those who are not graduates.

Mechanics Course at Indiana Normal School. The Indiana Normal School at Terre Haute, Ind., is offering a teacher-training course in mechanics for those who desire to become teachers of these subjects. The course covers machine-shop practice, carpentry, printing, and cabinetmaking.

special

IRWIN CABINET SET FOR VOCATIONAL AND MANUAL TRAINING INSTRUCTORS AND STUDENTS

13 BITS — STYLE 62 TS



These are the kind of bits the fine cabinet maker uses. They were built for just such work. The screw is pitched to feed at just the right speed for best work. Spurs and Cutters, in fact, the entire cutting heads are specially designed to meet the conditions of vocational education work with its variety of materials. The set includes Irwin Smoothbor Auger Bits in sizes 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16/16ths—Total 32½ Quarters—13 Sizes.

This Irwin Cabinet Set

May be had in either Borkit No. DSR or Borcase No. DS. This arrangement gives an instructor the opportunity of explaining the use of bits, the sizes to use on different work, and it also keeps bits together in better order and condition.

Irwin Cooperation for Instructors

We will be glad to send on request to any students or classes our book "How to Select, Use and Care for Bits." We also have a limited number of demonstration panels showing how bits are manufactured. These panels are available at times for school use. Write us about them.

IRWIN AUGER BIT COMPANY

WILMINGTON, OHIO.

IRWIN *Auger Bits*

VERSATILITY and SIMPLICITY

are the outstanding characteristics of the KLUGE FEEDER. Add to these mechanical perfection and productive efficiency and you have a combination of virtues with which every student-printer should become acquainted. A thorough understanding of what the KLUGE FEEDER can and does do for the printer means a much more encouraging experience when he starts out to conquer the world.

The KLUGE AUTOMATIC JOB PRESS FEEDER

Brandtjen & Kluge Inc.
Office and Factory: 310-312 Cedar St.
Saint Paul, Minnesota.

New York, Detroit, Chicago, St. Louis, Dallas, Atlanta, San Francisco.

Instructors, Supervisors, and Superintendents should write for a class supply of our descriptive booklet "Let Merit Decide."

PERSONAL NEWS NOTES

(Continued from Page 39)

Mr. Victor Hoffert has been appointed as a teacher of woodworking at Stout Institute, Menomonie, Wis.

Mr. Robert Hoppock of Lambertville, N. J., has gone to Rahway, to take a position as vocational counselor in the high school. Mr. Hoppock brings to his work considerable experience both in teaching and business. He completed his graduate work under Dr. John M. Brewer of Harvard University and under Col. W. V. Bingham of the Personal Research Federation, specializing in economics and vocational guidance.

Mr. Walter V. Horn of McLean, Ill., has accepted a position at Atlanta.

Miss Merle E. Irwin of Oak Park, Ill., has been appointed vocational adviser at the Spalding School for Crippled Children, Chicago, Ill.

Dr. Ralph L. Jacobs has been appointed dean of the new vocational department in the college of education, University of Cincinnati, Cincinnati, Ohio. Dr. Jacobs will have charge of the teacher-training work for vocational teachers.

Mr. Leslie Jessen of Chicago, Ill., has accepted a new position at Sycamore.

Mr. E. A. Long of Pottsville, Pa., has accepted a position in the Boys' High School at Reading.

Mr. Owen McGown has been appointed instructor in manual training at Monmouth, N. Dak.

Mr. Burdette McKinney is the manual-training instructor at Casselton, N. Dak.

Mr. M. J. Mersch has resigned as a member of the vocational board at Stevens Point, Wis.

Mr. Charles A. Montague has been appointed manual-training instructor at Edgeley, N. Dak.

Mr. R. C. Mullinger has been appointed instructor in welding at the Central High School, Pueblo, Colo. Mr. Mullinger has a class of eighteen boys taking work in acetylene welding. The boys work on projects for their own use including porch lamps, flower boxes, and other useful articles.

Prof. W. F. Rasche, who has been taking graduate work at the University of Chicago, has accepted a position in the vocational department at Pittsburgh, Pa. Prof. Rasche formerly taught in the Milwaukee Vocational School. He holds a bachelor of science degree given by Stout Institute, and has completed work for a master's degree at Chicago University.

Mr. W. B. Rentschler has been appointed assistant supervisor of agriculture in the Benton Vocational School at Benton, Pa.

Mr. Henry D. Schultz, formerly assistant professor of industrial education at the State Normal and Industrial School of North Dakota, has accepted the position of director of industrial education at Berea College, Berea, Ky. Mr. M. W. Hechmann has been appointed to fill the vacancy at Ellendale.

Mr. Lowell B. Selby of Cincinnati, Ohio, has been appointed to a new position in New York City.

Mr. Paul J. Sticht of Buffalo, N. Y., has gone to Eggertsville.

NEWS AND NOTES

Plumbing Shop Has Large Enrollment. The plumbing shop of the Mechanics' Institute, Milwaukee, Wis., has enrolled 92 students in evening classes. The majority of these students are already employed in the plumbing trade and the men are studying for advancement.

Of the 92 men attending the classes, 36 are wiping joints, 24 are in the lecture room studying code rules, and 12 are employed on layout work and estimating.

Gas Engineering Courses at Johns Hopkins University. The gas-engineering department of Johns Hopkins University, Baltimore, Maryland, has entered upon the third year of the course. A coordinated curriculum is offered and university degrees are given for the successful completion of courses. The department was established in 1924 in response to a demand for an expansion of the engineering department and includes courses in gas and fuel engineering.

Vocational-Training Classes growing in Demand. The vocational classes at Enid, Oklahoma, will this year offer extensive training in both day and night schools. The senior high school is offering classes in automobile mechanics, electricity, woodwork, forging, printing, journalism, and home economics. The classes in auto mechanics and printing have reached a capacity enrollment.

In the evening school this year there will be offered courses in blue-print reading, mechanical drawing, shorthand and typewriting, manual training, Spanish, cooking, sewing, and bookkeeping.

The high school cooperates with the government in offering vocational courses of Smith-Hughes type. Classes have been organized in part-time, trade-extension and general continuation-school work.

Peckham Added to List of Evening Schools in Buffalo. The new Peckham Vocational School at Buffalo, New York, has been added to the list of evening schools. During the present year, evening classes will be held in three high schools, four vocational-training schools, 25 grammar schools, and the Girls' Continuation School. An enrollment of 30,000 students in the evening classes is anticipated by the school authorities.

Vocational Courses in El Paso. The Vocational School at El Paso, Texas, aims to take the place of the apprentice system and to that extent takes care of the nonacademic pupils in the school. Day trade classes for boys are offered in the subjects of machine-shop practice, auto mechanics, auto electricity, carpentry, and printing. Each of the courses includes one-half day in the shop and one-half day of training in mechanical drawing, practical mathematics, and English. Day classes for girls are conducted in the subjects of dressmaking, power sewing, and household service, together with related English, hygiene, and mathematics. In addition to these, there are mixed day classes for boys and girls in typewriting, stenography, bookkeeping, comptometry, and business English.

The evening classes are for persons employed during the day. Trade classes are offered in auto mechanics, auto electricity, machine-shop practice, carpentry, printing, acetylene welding, dressmaking, millinery, drawing, mathematics, and blue-print reading. Additional night classes not listed as vocational are offered.

Home-Economics Course. A course in elementary home economics for seventh- and eighth-grade girls of the junior high school has been introduced at Galena, Kans. The course is exploratory in character and attempts to determine the interests and tendencies of junior-high girls, rather than to supply a heavy, comprehensive course in sewing or cooking.

Growth of Apprentice Schools in New Jersey. A report has been issued showing that enrollment in evening schools for apprentices in building trades in New Jersey has grown from less than 100 to more than 3,200 in the last five years. Employers and organized labor are in sympathy with the work and cooperate in many ways in different localities. A number of trade organizations pay the tuition of employees obliged to attend school in another district. In Rahway and other places, apprenticeship agreements concerning school training and relations between employer and employee have been worked out in the printing and carpentry trades. Vocational schools in Essex county, in cooperation with the superintendents of electroplating plants, have organized a class for the study of the deposition of metals.

Ranken Trade-School Graduates Remain in the Trades. Of the men completing the course in carpentry at the David Ranken School of Mechanical Trades, St. Louis, from 1911 to 1927, 84 per cent have followed the trade of carpentry. Percentages of persistence in students of other trades were: Painting, 84 per cent; plumbing and automobile, 85 per cent; machine shop, 81 per cent; steam engineering, 77 per cent; patternmaking, 76 per cent; and electricity, 80 per cent.

New Bedford Vocational-School Courses. The Vocational School at New Bedford, Massachusetts, is offering trade courses in the subject of automobile mechanics, steam engineering, machine work, electricity, and carpentry. The courses are four years in length but the time may be reduced, depending on the ability of the student to progress. The day school for girls offers courses in cooking, sewing, millinery, design, household management and science, home nursing, and home-project work.

The New Bedford School does not guarantee employment to its graduates, but it is a fact that almost 100 per cent of the students graduating have been satisfactorily placed in the trades for which they were trained.

Brooklyn Technical High School Has Capacity Enrollment. The Brooklyn Technical High School at Brooklyn, New York, with the opening of the fall term, has been compelled to deny admission to more than two hundred students because it has reached the capacity of the building. The most effective relief for the school will come from a new building, site for which has been selected. One of the difficult problems has been the accommodation of pupils in the face of limited machine-shop and laboratory facilities.

The classes in technical studies are the most important in the Brooklyn Technical High School and the periods cannot be shortened or reduced in number. In an effort to increase the accommodations, students of the higher grades are being programmed for a ten-period day with eight class periods. The ten-period day applies to students using the seventeen shops which are in constant use throughout each school day.

Vocational Courses at Washington Irving High School. The Washington Irving High School, New York City, in addition to the regular academic subjects, offers a variety of vocational courses, including printing, typography, proofreading, costume design, drafting, mechanical drawing, free-hand drawing, textile design, interior decorating, commercial art and poster design, trade millinery, lampshade novelty work, trade dressmaking, trade embroidery, homemaking and dietetics.

Six Day Classes
Two Night Classes

The Only Table That Will Do the Job

Recently one of the new High Schools in one of America's greatest cities was in need of a Drawing Table that would accommodate six day classes and two night classes. They found this Kewaunee No. 205 was the only table available that would satisfactorily serve their purpose.

This Table provides private compartments for the equipment of eight students. As will be observed by the illustration, three perpendicular lockers open in the front, while three similar ones open in the rear. Each compartment will hold a 22 x 28 drawing board, a large set of instruments, scale, triangles, ink, detailed paper, etc., with a slot for a 24-inch T square. It puts everything of the student under individual lock and key except text books. Locks may be our standard master-keyed cabinet, or padlocks if desired.

These Tables are being installed in many schools to take the place of old drawing tables and wall cases. They eliminate confusion and increase efficiency.

This Table will meet all the requirements of the average high school or university.

We are manufacturers of a very complete line of Art and Mechanical Drawing Tables. Write for our complete Book of Illustrations.

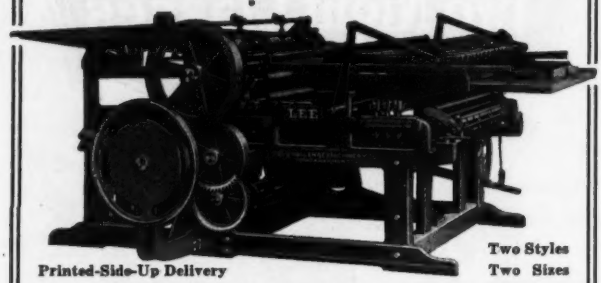
Kewaunee Mfg. Co.
LABORATORY FURNITURE EXPERTS

Designers and Manufacturers of Art and Mechanical Drawing Room Furniture for Schools and Colleges

KEWAUNEE-ECONOMY PLANT No. 2
ADRIAN, MICH.

Kewaunee

A Simplified and Economical Press



Printed-Side-Up Delivery

Two Styles
Two Sizes

Made in Two Styles: Carrier Delivery and Fly Delivery

24 x 36 Inch Lee: Size of Bed 26 x 38; Size of Form 22 x 35
25 x 38 Inch Lee; Size of Bed 29 x 42; Size of Form 25 x 38

Both sizes of Lee Presses are built with Carrier Delivery, but the 24 x 36 inch size is made in both Carrier and Fly Delivery styles.

Equipped with Counter, Jogger, Cast Rollers (form, rider and angle), Quick-Stop Brake, Trip, Micrometer Feed-Guides, Hard Packing, Tools, Oilers, Etc.

THE LEE TWO-REVOLUTION PRESS is a Versatile and Economical Press—because of its quick adaptability to handle a large range of work, from a small circular or single letterhead to the highest grade of commercial work in one or more colors; fine register and distribution; rigid impression and sturdy construction; built-in durability and handsome appearance; economical first cost and low upkeep, and for its general dependability.

Send for full information regarding the Lee Press and ask for literature describing any of the following machines and utilities used throughout the world in the Graphic Arts:

Diamond Power Paper Cutters
Advance Lever Paper Cutters
Hoerner Combination Type-High Machine
Mercantile Addressing Machine
Sieber Adjustable Hand Punch
Challenge Proof Presses
McGreal Combination Printers' Chases
Challenge Labor-Saving Iron Furniture
Challenge Mammoth Iron Furniture
Challenge Notched Iron Furniture
Challenge Semi-Steel Imposing Surfaces
Challenge Pressed Steel Galleys
Challenge Rigid Rim Galleys
Challenge Iron Sectional Blocks and Hooks
Challenge Type-High Gauges
Challenge Quoins and Keys

The Challenge Machinery Co.

GRAND HAVEN, MICHIGAN

Chicago, 17-19 E. Austin Ave. New York, 220 W. 19th St.

NOTE—A handy brass-edge Printer's Gauge, showing 6 and 12 points and inches, sent free—if you mention this ad.

Vocational Education for Farm Children. Vocational education for farm children has progressed until there are now 510,355 young people enrolled in federal club work, according to a survey report of the Monthly Labor Review. Of the total number, 58 per cent are girls. The work is of considerable importance since it provides trained and efficient farm labor.

As the first step in extension work among children, the attempt is made to form 4-H clubs among the boys and girls of the country. Members undertake one or more specific projects—the raising of a pig, a cow, chickens, the cultivation of a plot of ground, and pledge themselves to follow the best practices as determined by state and federal government departments.

The field of the work is limited to 11,000,000 rural boys and girls between the ages of 10 and 18 years, of whom 27 per cent are not in school. The projects undertaken include work in the raising of various kinds of farm animals, planting and caring for crops, judging livestock, seeds, dairying, forestry, sewing, canning and preserving, cooking, renovation of furniture, sanitation and health work.

Although in general, the boys' projects are usually some work connected with the farm, and those of the girls with the home, this is not always the case. Thus, of the 300,545 girls enrolled, 173,545 are engaged in some phase of clothing construction and 83,140 are interested in food preservation.

There are also 51,921 girls in poultry clubs, 7,224 in dairy clubs, and 66,499 girls in gardening projects. As the boys and girls see the work expand and notice the results obtained through scientific methods, their interest is aroused along other lines and they undertake new and different projects.

Over One Hundred Schools Teach Home Economics. The Illinois Department of Vocational Education in home economics has issued a summary of the department's work for the 1926-27 school year, which shows that courses in home economics were offered in 127 schools with a total enrollment of 7,909 students and 210 teachers. Evening classes totaled 27 with 9,285 students and 320 teachers.

Wisconsin to Participate in National Radio Audition. Preparations have been made to enable Wisconsin to participate in the National Radio Audition of the Atwater Kent Foundation of Philadelphia, Pa. The state has been canvassed to enlist the cooperation of civic and social organizations, educational leaders, and others interested in the advancement of vocal culture to serve as a state sponsorship committee.

The state audition will be participated in by two singers, a young man and a young woman, from each of the communities holding auditions. Two winners will be selected in October to participate in a larger, or district, radio contest. The district winners will be eligible for participation in the final national audition which will be held in New York in December.

Five young men and women will compete in this final contest, for cash prizes aggregating $17,500. The first national awards will be a gold decoration, $5,000 in cash, and two years' tuition in a leading American conservatory; second-place awards will be $2,000 in cash, and one year's tuition; third awards will be $1,000 in cash, and one year's tuition, while winners of fourth-place awards will receive $500 each, and fifth-place winners, $250 each.

New York City Board Appoints Six Vocational Counsellors. The board of education of New York City has ordered an extension of school counselling to a dozen or more schools through the appointment of six new counsellors. At present, two counsellors are at work in four Manhattan elementary schools, and funds are available for the six new counsellors to be installed this year.

In line with the extension of vocational guidance, the board has also established the position of director of vocational guidance. The work of this official will later be combined with that of the placement bureau in the hall of the board of education.

The extension of vocational guidance work is attributed to the invaluable service which the school counsellor has been able to perform for graduates of the elementary and junior high schools. These counsellors not only direct students to the right path in life, but they counsel the parents and aid the boys and girls in selecting courses and schools. Mental tests and school records are utilized in determining the best courses, whether technical, academic, or commercial, for the pupils.

Dedicate Hershey Industrial School. The new $500,000 assembly hall and four buildings of the Hershey Industrial School at Hershey, Pa., was dedicated on Labor Day, September 5.

Vocational Activities in Agricultural High School. Hog sanitation, potato and corn contests, sow, sheep, and other projects are among the activities engaged in by the agricultural department of the Hartford, S. Dak., high school. In addition to the regular course in agriculture, six culling and four caponizing demonstrations have been given since last fall; 222 samples of milk were tested, balanced rations were worked out, and fifteen cream separators were tested and adjusted by the instructor and class. Two centers have been established for evening instruction of adults in dairying.

Equip Home-Economics Room. The home-economics room of the high school at Russellville, Ky., has been equipped by the parent-teacher association, at a cost of about $300.